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DISCOVERY REPORTS

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FISH & WILDLIFE SERVICE
PACIFIC OCEANIC FISHERY
INVESTIGATIONS

THE BATHYPELAGIC ANGLER FISH *CERATIAS HOLBÖLLI* KRÖYER

By

ROBERT CLARKE, M.A.

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THE BATHYPELAGIC ANGLER FISH *CERATIAS HOLBÖLLI* KRÖYER

By Robert Clarke, M.A.

(Plate I; Text-figs. 1–6)

INTRODUCTION

Bertelsen (1943) considers that the deep-sea angler fishes or Ceratioidea are, in some respects, the most peculiar and specialized of all fishes. They derive their name from *Ceratias holbölli* Kröyer, which is the largest species in the group and the fish from which Regan (1925*a*) first described dwarf-males. Yet of this fish only twelve specimens, several of them damaged, have been recorded since Kröyer erected the genus and species in 1844. Bertelsen gives a list of these, all of them from arctic or boreal-arctic seas.

Furthermore, Bertelsen has described the remarkable apparatus for extending and retracting the fishing lure in *C. holbölli*. His new interpretation of the structures involved led him to revise the systematics of the family Ceratiidae which Regan & Trewavas (1932) had divided into the three genera *Ceratias* Kröyer, 1844, *Mancalias* Gill, 1878, and *Cryptopsaras* Gill, 1883. Bertelsen concludes that *Mancalias* is invalid and actually comprises juveniles of *Ceratias*. Within the genus *Ceratias* he reduces the number of species to a northern *C. holbölli* and a southern *C. tentaculatus*.

The following account includes the description of a new specimen of *C. holbölli*. It is from Antarctic seas, and its oceanic origin makes it specially interesting, since the other adult individuals have been taken from neritic seas. Furthermore, it is the first large adult to be recorded from the southern hemisphere.

MATERIAL

During the Antarctic whaling season 1947–8 I was able to examine a number of Sperm Whales (*Physeter catodon*) on board the whaling factory ship 'Southern Harvester'. The stomach contents of these whales consisted principally of squid, but occasionally teleost fish were present. In a later account it is hoped to deal generally with the occurrence of fish in the stomachs of Sperm Whales.

The present paper refers repeatedly to a single adult female of *Ceratias holbölli* which was found in the stomach of Whale no. SH 156, Sperm ♂, 50·0 ft. (15·2 m.) long, on 21 December 1947. The whale was worked up very shortly after capture, the noon position of the factory ship being then 61° 20′ S, 102° 50′ E. The first stomach was full, containing many individuals of the squid *Moroteuthis ingens* Smith. On raking these over I found a large Ceratiid fish scarcely touched by digestive action and with the fishing lure intact. There were no other fish present.

The specimen was removed from the flensing deck and was measured and sketched whilst still fresh. The body cavity was injected with 10 % neutral sea-water formalin, and the fishing lure removed for safe transport before both fish and lure were fixed in formalin.

The fish has since been presented to the British Museum (Natural History) where I have been able to examine it further and to compare it with other Ceratiids in the national collection.

ACKNOWLEDGEMENTS

I am indebted to Messrs Christian Salvesen and Co., owners of the 'Southern Harvester', and to the master, Captain Konrad Granøe, for facilities afforded on board that vessel. I also wish to thank the Director and Trustees of the British Museum (Natural History) for working accommodation and for access to the collection of fishes. Dr N. A. Mackintosh has extended helpful criticism and suggestions. Dr Ethelwynn Trewavas has kindly read the manuscript, and I owe especial thanks to her and to Mr N. B. Marshall for much advice.

DESCRIPTION OF AN ANTARCTIC SPECIMEN

In identifying the new specimen as *Ceratias holbölli*, and so extending the range of this species into Antarctic seas, I have been assisted by access to the individual* (67 cm. standard length) from which Regan (1925*a*) first described dwarfed males. This has supplemented comparisons with descriptions in the literature.

EXTERNAL CHARACTERS

Standard length 43·0 cm.
Weight 3580 g.

The general appearance of the fish (Pl. I) closely resembles a photograph (Bertelsen, 1943) of the specimen 65 cm. long, which has been briefly described by Saemundsson (1939). There were no dwarfed males attached to the new specimen.

The rays of the dorsal and caudal fins were more or less broken and lacked the distal portions of their integuments, as also did the exserted part of the basal bone of the lure.† Otherwise the specimen was intact.

Measurements of the fish expressed as percentages of the standard length are included in Table 1, together with those of Kröyer's type and Regan's 1925 specimen. In general they show good agreement, but the matter of proportions will be pursued later.

The spines which beset the skin are conical and with broad bases as described by Kröyer (1844) and Regan & Trewavas (1932). The largest are 0·3 cm. high and 0·4 cm. across the base. They are evenly distributed over the body surface, except for a naked area in front of the pectoral fin, extending from a point slightly above the fin forwards and downwards over the region of the gill-cover (Pl. I). A few small spines are scattered just below the lower jaw. In Regan's example the spines are more numerous, more closely set, and more extensively distributed over the body, but they are sparser on that part of the head which in the new specimen is naked. The largest spines are 0·6 cm. high and 0·9 cm. broad, and therefore not relatively larger than those in the new and smaller specimen.

The colour‡ in the head region of the new specimen is greyish black. More posteriorly, in the upper parts of the body and flanks of the tail, this greyish black colour is mottled with irregular dirty white patches. The belly is a dirty grey tinged with black. There is less pigment on the right side of the body than on the left, but this difference, and the mottled appearance, may be attributed to digestive action. The smooth or naked region of the head was steel blue when fresh, and the outlines of the branchiostegal rays beneath could be seen. The sparsely spinal area below the lower jaw is black. Four black streaks extend slantwise across the smooth area. The inside of the mouth, including the large tongue, is black, and so is the anterior border of the opercular opening. The body colour of Kröyer's type and Regan's specimen was blackish.

The mouth of the new specimen has a large gape of 130°, and the upper jaw (as in Regan's specimen) is rotated back 25° past the vertical. Vomerine and palatine teeth are absent—a character shared by all the Ceratioidea (Lutken, 1878). The teeth are confined to the dentary and premaxillary and are directed inwards. They are slender, sharply pointed and small, the longest measuring 0·4 cm. In the dentary, and especially near the symphysis, they tend to be arranged in two series, the inner series including the longest teeth. This character is contained in the synopsis of the family given by Regan & Trewavas (1932). The teeth in the premaxillary are mostly smaller, and there is less indication of a second series. The dental formula is $\frac{14}{15} \cdot \frac{11}{15}$. In Regan's specimen the shape and arrangement of the teeth are the same, and relatively they are the same size, the largest being 0·6 cm. in length. Their formula is $\frac{8}{24} \cdot \frac{8}{23}$. The difference in the number of teeth is not considered significant in the two specimens since, as Waterman (1939*b*) has pointed out, there are at present no data on the individual and ontogenetic differences in the teeth of Ceratioids.

---

* B.M. (N.H.) 1924. 12.29.1.

† This damage can at least be partly attributed to incipient digestion, although the fish was removed from the Sperm whale's first stomach which has no digestive lining and acts as a storage organ. Food in this stomach quite soon begins to be attacked by gastric juice, which presumably has been regurgitated from the second stomach during the convulsion following harpooning, or has leaked over after death.

‡ All observations on the colour are transcribed from notes made on the fresh specimen.

The gill opening, in both the new and Regan's specimen, is an oval aperture immediately below and a little posterior to the insertion of the short peduncle of the pectoral fin.

There is close correspondence between the fins of the new specimen and those of Kröyer's type and Regan's specimen. As in these the dorsal fin has four rays. There are no ventrals. The small pectoral fins have nineteen rays each in the new specimen and in Kröyer's type. Regan's specimen has eighteen pectoral fin rays. All three examples have four rays in the anal fin. Kröyer gives eight rays for the caudal fin of *C. holbölli*, and Regan & Trewavas (1932) also define eight rays for the family, Ceratiidae, although Lutken (1878) and Gill (1878) stipulate nine and Regan (1926) allows eight or nine. Beebe & Crane (1947) find an incipient ninth ray in some of their specimens of '*Mancalias uranoscopus*'. The caudal fins of the new specimen and of Regan's have eight rays and the four middle ones are forked (Regan & Trewavas, 1932). But the caudal of the new specimen, like that of Saemundsson's 1939 example (see Bertelsen, 1943), is damaged and does not possess the ribbon-like prolongations found in the type and in Regan's specimen.

Smallness of the eye has long been recognized as a character of deep-sea angler fish, especially the Ceratiidae (Kröyer, 1844; Lutken, 1878; Gill, 1878; Günther, 1887; Regan, 1912 and Waterman, 1948). In describing his monospecific genus *Typlopsaras*, Gill (1883) gives 'obsolete or no eyes'. *Typlopsaras* was included with *Mancalias* by Regan & Trewavas (1932) and has since been regarded as a juvenile *Ceratias* by Bertelsen (1943). Gill does not clarify these remarks on the eyes in his description of the single specimen *Typlopsaras myops*. The eyes of the new specimen, besides being small, are especially interesting because they are subcutaneous. In the region where one would expect to find the eye there is a ring of black pigment, stippled with minute spines. This ring encloses a small circular area, 0·4 cm. across, where the skin is transparent and forms a kind of eyeless window. When first examined two small blood vessels could be seen to cross its floor (Fig. 1A). The eye itself is completely concealed below the normal opaque skin, in a position immediately dorsal and adjacent to the pigmented ring; it may be exposed by an incision. Undoubtedly the specimen was functionally blind. I have found that the eye is also subcutaneous in Regan's specimen, although he has apparently overlooked this in his very brief accounts of the fish itself (1925*a*, *b*, 1926), being naturally preoccupied with dwarf-males. As would be expected, his photograph of a cast made from the specimen (1925*b*) shows no trace of the eye. In Regan's specimen the disk of transparent skin surrounded by a ring of pigment is not to be found. The figures of Kröyer's type displays a small eye (Gaimard, 1842–56, *Poissons*, pl. ix). Bertelsen's text does not mention the eyes in the two specimens he describes, but no eye is visible in his photograph of Saemundsson's 65 cm. example. Significantly enough, the eye may be discerned in his much smaller 18·5 cm. specimen recovered from west Greenland in 1880. This matter of the eye will be discussed later (see p. 15).

Nostrils have not previously been described in *Ceratias*. They are present as much reduced structures in both the new specimen and that of Regan, and they have a very similar appearance in both. They are small tubular nostrils, and take the form of a pair of flattened, somewhat elongate sacs, each opening by a small pore, and appearing as a tag of black skin, 0·9 cm. long, a little above the level of the eye and just behind the distal end of the maxillary (Fig. 1A).

The lateral line system of the new specimen has been followed only in the head region, where it forms a curving line of small black papillae arranged in a single, regularly spaced row. It begins at the tip of the lower jaw and runs downwards and backwards to curve up again and extend half-way across the smooth region of the gill covering. A little distance from its beginning on the lower jaw, the lateral line sends a short branch, with relatively few papillae, as far as the articulation of the jaw (Pl. I). The older authors (Lutken, 1878; Gill, 1878) have denied the existence of a lateral line among the Ceratioidea. Günther (1887) mentions pores, scattered over the skin of '*C. uranoscopus*' and '*C. carunculatus*', which secrete luminous mucus; these may be referred to the lateral line. Later, Regan & Trewavas (1932) described the various modifications of the lateral line organs of Ceratioids, and classified the Ceratiidae with four other families as possessing 'organs on stalks'. Each papilla of the new specimen is a flattened tag with a broad, pear-shaped outline. The tip bears the white organ mentioned by Regan & Trewavas. This form, although nearest to the 'organs on tags', does not fit any category of their classification. Waterman (1939*b*) was likewise unable to classify the tagged lateral line organs of his small holotype of *Gigantactis longicirra*. It is possible that the form of the papillae in the various genera may undergo ontogenetic changes of which the classification takes no account. No superficial groove or subcutaneous canal could be found connecting the papillae in the new specimen. The special significance of the lateral line in *Ceratias* will be discussed later.

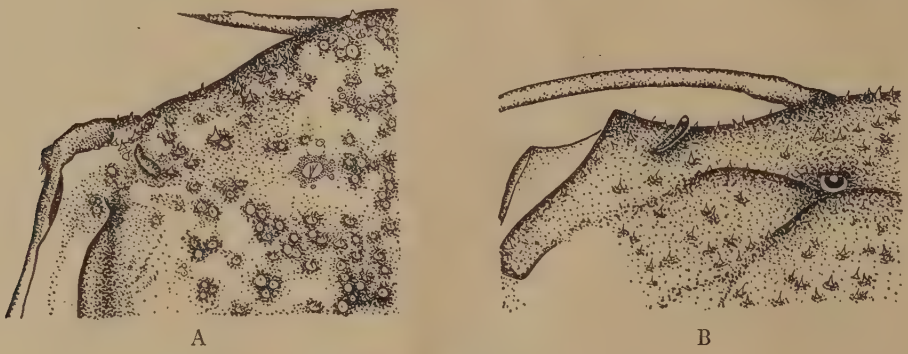

Fig. 1. *Ceratias holbölli* Kröyer. Upper part of the head showing the eyes and nostrils. (In the Antarctic specimen the eye is subcutaneous; its position is indicated by a pecked circle above the 'eyeless window'.) A. Antarctic specimen, × $\frac{2}{3}$. B. '*Mancalias bifilis*', × 12.

The anus and urogenital aperture of the new specimen open upon an area of naked slatey-blue skin which is raised somewhat from the body surface. The urogenital aperture is a transverse slit lying immediately posterior to the anus. Regan's specimen shows a similar appearance, although the eminence on which the vents open is only slight.

The stomach of the new specimen was completely empty.

THE FISHING LURE

Among the Pediculate fishes, the use of the cephalic tentacle as a fishing line in *Lophius* was first asserted by Aristotle. This has since been confirmed by the aquarium observations of Chadwick (1929) and Wilson (1937). Angling activity has also been observed in *Antennarius* (Mowbray, 1938 in Waterman, 1939*a*). In the more highly modified Ceratioid Pediculates the cephalic tentacle becomes a prominent feature. This tentacle is derived from the modified front portion of the dorsal fin. Kröyer (1844) considered that in *Ceratias* it represented the first dorsal fin ray. Later authors (Brauer, 1908; Waterman, 1948) working on *Gigantactis*, have concluded that a rudiment of the second fin ray also enters into its structure.

In the Ceratiidae the cephalic tentacle achieves its most considerable development as an angling device. Here the first external ray of the fin, called the illicial ray or illicium, is suspended in front of the head upon an exsertion of the pterygiophor or 'basal bone' of that ray. The distal end of the illicium is expanded into a luminous bulb, so that this apparatus projecting from the head is virtually that of a fishing rod, line and bait. The cephalic tentacle of the new specimen is a stiff, slender rod which, when found, extended at an angle of 20° to the horizontal and protruded 15 cm. from its insertion on top of the head above the vestigial eyes. The illicial ray was jointed to its distal end and measured 6 cm. (Pl. I).

Waterman (1939*a*) has pointed out that it was Reinhardt (1837), describing *Himantolophus*, who first implied that the illicium functions as a lure. Later this was definitely asserted by Lutken (1871). The luminosity of the bulb, or 'esca', in certain Ceratioidea was first mentioned by Willemoes-Suhm (1877). In 1878 Gill independently suggested that the bulb was a luminous organ, and intimated its significance as a luminous bait for the lure. The bulb has been credited with other functions. Thomson (1877) described the illicium of *Ceratias uranoscopus* and favoured the belief (which may be partially true) that the terminal bulb is a sense organ, informing the angler fish of the approach of prey, rather than a lure to attract it. Goode (1880) and Goode & Bean (1895) expressed a similar opinion. A modification of this theory was advanced by Parr (1932), who suggested that the luminous organ subserved the sexual function of attracting the males (which have no functional illicium). This possibility has been further discussed by Waterman (1948).

Recently Bertelsen (1943) has been able to establish, beyond reasonable doubt, that the cephalic tentacle, at least in *C. holbölli*, is pre-eminently a fishing lure. He showed that the arrangement and musculature of the basal bone was such that it could either be exserted or withdrawn, and continues (p. 194): 'When the tentacle is withdrawn, the prey attracted by the luminous bait on the exserted tentacle may be lured straight into the mouth of the fish.' In connexion with this mechanism the dorsal tentacle is important. This structure occurs in all Ceratiidae and has been variously described as a tentacle, 'papilla' or 'pore' lying immediately in front of the caruncles on the dorsal surface. Kröyer (1844) considered it to be the second dorsal fin ray, and Regan & Trewavas (1932) described it as the third. Rauther (1941)* dissected a damaged specimen of *C. holbölli* and believed that the tentacle contained the prolongation of a pterygiophor which was jointed at its anterior end with the basal bone of the cephalic tentacle. But Bertelsen, working on an undamaged specimen, showed that the dorsal tentacle is in fact a sheath derived from the skin of the back, which receives the proximal part of the basal bone of the illicium. From its insertion on the head this long, slender fishing rod continues in a trough along the upper surface of the skull and between the dorsal muscles. When the rod is fully exserted the dorsal tentacle is invaginated and appears only as a pore raised on a short peduncle. When the rod is withdrawn its proximal end completely pierces the back and emerges, sheathed in pigmented skin, as this conspicuous dorsal tentacle. Bertelsen thus established the identity of the 'tentacle', 'papilla' and 'pore' of other authors, and in the light of this evidence proceeded to revise the systematics of the Ceratiidae.

Bertelsen does not say that he was able to move the rod in and out, since the discovery of its extraordinary adjustability was deduced from morphological observations on fixed and hardened material. Now I had not read his 1943 paper when I first examined the new specimen, without dissection, on board the whaling factory ship 'Southern Harvester'. The following extract from my field notebook on 26 December 1947 is therefore advanced as independent evidence supporting Bertelsen's conclusions:

---

* Quoted by Bertelsen (1943). Rauther's paper is not at present available in England (June 1949).

'When the fishing lure was removed for safe preservation I found it possible to withdraw the (basal) bone, without forcing, for a distance of 24 cm.... It extends back at least as far as the base of the dorsal tentacle, where it probably has its morphological origin (although an X-ray photograph* of this region was taken, but revealed nothing).... Is it possible that the rod can be pushed out and in, i.e. is adjustable for length? Certainly the rod, when half pulled from its insertion (on the head) and let go, slowly moved back again.'

The dorsal tentacle of the new specimen (Pl. I) is a cylindrical structure, quite soft and flaccid when fresh, and of a greyish black colour. The tip is slightly expanded. It measures 6 cm. and is raised upon a distinct peduncle 1·2 cm. high. According to Bertelsen's conclusions, this tentacle should have invaginated when the lure was pulled from its insertion. I cannot recollect this, but it may have happened and been overlooked, the examination being hurried and the phenomenon unsuspected. Alternatively, the proximal end of the rod may have become detached from the inside of the tentacle after death.

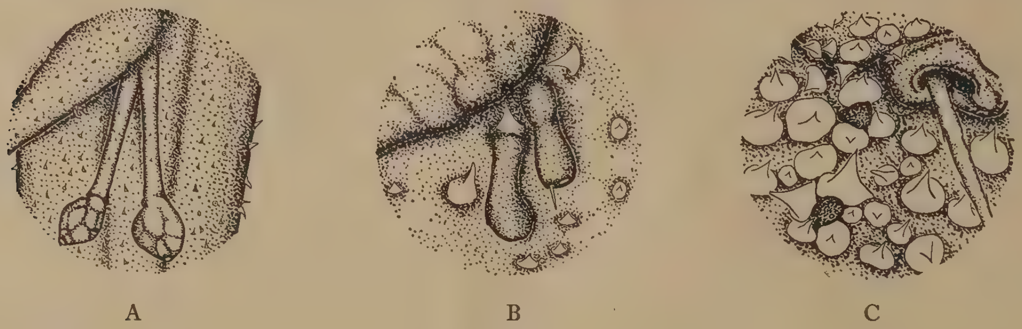

Fig. 2. *Ceratias holbölli* Kröyer. The caruncles. A, '*Mancalias tentaculatus*', ×5. B, Antarctic specimen, ×2½. C, Regan's specimen, ×1½.

In Regan's specimen the cephalic tentacle is absent and he notes 'that the dorsal tentacle is long, reaching beyond the base of the caudal fin, when laid back, and bears a terminal bulb' (Regan, 1926, p. 34). He considered this was either the normal structure of the dorsal ray, or an assumption of the structure and function of the cephalic tentacle caused by loss of this tentacle during life (Regan, 1925*a*). I have re-examined this long dorsal ray, which emerges from the torn base of the former integument of the tentacle (Fig. 2C). It is spirit material, and appears inelastic and much shrivelled. Probably it represents a part of the pterigiophor prolonged by remnants of its musculature; the 'terminal bulb' seems to be a bunched knob of connective tissues. There is little doubt that these damaged structures correspond to the dorsal tentacle of the Antarctic specimen.

The musculature of the cephalic tentacle of the Ceratioids has been studied in *Gigantactis* by Brauer (1908) and Waterman (1948), and in *Ceratias* by Rauther (1941) and Bertelsen (1943). Brauer could find only four pairs of muscles associated with the structure. Both Bertelsen and Waterman have recorded five pairs, which can be homologised in the two genera. Two of these muscles are the retractors and exsertors of the basal bone. They are elongate and weak in *Gigantactis* where fore-and-aft adjustability of the lure is not specially developed. On the other hand, in *Ceratias* they are elongate, but also large and powerful, and are the principal effectors of the mechanism already described. A third pair of muscles are attached to the basal bone. They are powerful in *Gigantactis*, where Waterman describes them as the inclinators of the illicium. They are small and weak in *Ceratias*, where they may also, as

---

* By the ship's surgeon, Dr Michael Gilkes, to whom I am indebted. Probably the hardness of the X-rays employed accounted for the failure.

Bertelsen points at, contribute to pull the tentacle forwards. The remaining two pairs of muscles are the erectors and flexors of the illicial ray at its joint with the distal end of the basal bone. In *Ceratias* these muscles are relatively small, but they are large and powerful in *Gigantactis*. Movement of the lure in *Gigantactis* is mostly at the level of the illicial ray, but in *Ceratias* at that of the basal bone.

The musculature of the lure in the new specimen has been examined. The precise attachments to the basal bone of the exsertors, retractors and inclinators could not be determined, since the lure had already been removed on preservation. But these three pairs of muscles appear virtually as described and figured by Bertelsen, to whose paper reference should be made. The black integument of the exserted part of the basal bone has been either torn or digested away, and the muscles of the illicial ray have suffered in this damage, so that only the flexors of this ray can be clearly distinguished at the joint with the basal bone. When the fish was found the illicial ray dangled vertically, making an acute angle with the inclined basal bone (Pl. I); damage to the illicial erectors would presumably account for this condition.

The black integument of the illicial ray of the new specimen is expanded distally into a pear-shaped esca (Fig. 4C). About the middle of this bulb the black pigment changes to a dull blue and then gives place to a distal unpigmented region, until the pigment is resumed again as a small disk at the extreme tip of the organ. Two short filaments, pigmented for about half their length, spring from this black disk which is also pierced by a round pore (Fig. 2A). The fixed material shows some jelly-like exudate in the pore; this may be the erstwhile luminous mucus which such an open type of luminous gland might be expected to release. This particular esca has not yet been examined histologically, but Dahlgren (1928) sectioned the esca of a specimen of *Ceratias* and described it as an open gland wherein light was produced by a culture of bacteria which filled most of its lumen.

A terminal pore appears also to be characteristic of the escas of species of *Mancalias* as figured by recent authors (Regan & Trewavas, 1932; Imai, 1941), and it is significant that Bertelsen now regards the genus *Mancalias* as synonymous with *Ceratias*. The arrangement of the pigment on the esca of the new specimen agrees closely with that given for the escas of Bertelsen's Greenland specimen and Kröyer's type (Bertelsen, 1943). The incidence, number and arrangement of filaments on the esca have been assigned some specific value by most systematists of the Ceratioidea. With regard to *C. holbölli* Regan's incomplete specimen does not assist in a comparison of the escal filaments, but Bertelsen, who has re-examined Kröyer's type, states that both his own Greenland specimen and the type agree in bearing only one terminal filament, whereas the Antarctic specimen has two (Fig. 4C and D. Fig. 4D is from Gaimard; the base of this esca appears to be torn). What validity this difference may or may not have as a taxonomic character will be discussed later.

THE CARUNCLES

On the back of the new specimen, close behind the dorsal tentacle, there are situated two club-shaped structures. They lie close about the middle line, the right a little forward of the left. These organs are the caruncles. They are black and glandular in appearance and 0·6 cm. high. Each bears a terminal pore. A sharp spine protrudes from the tip of the right caruncle, and a spine can be palpated in the other where its presence is betrayed as a slight bulge on one side (Fig. 2B). The presence of these spines supports Rauther's conclusions that the caruncles are modified fin rays (Rauther, 1941).

Kröyer, Rauther (1941) and Bertelsen all mention the presence of similar club-shaped caruncles in their specimens of *C. holbölli*. Regan (1925*a*, *b*, 1926) does not mention the caruncles in his specimen. It is clear, as Bertelsen has pointed out, that among the three genera of the Ceratiidae, Regan (1926) and Regan & Trewavas (1932) regard only *Cryptosparas* and *Mancalias* as possessing caruncles, and not *Ceratias*. However, careful examination of Regan's specimen reveals the presence of two black sessile bodies lying among the spines posterior to the peduncle of the damaged dorsal tentacle. They are

0·4 cm. high, and each bears a small pore. They are undoubtedly caruncles. Although more widely separated than those of the Antarctic specimen, the right caruncle still lies slightly in front of the left (Fig. 2C). The presence of caruncles may now be accepted as a character of all members of the Ceratiidae without exception. Their possible significance will be discussed later (p. 19).

THE VISCERA

Kröyer made brief reference to the internal organs of *Ceratias*. The viscera of Ceratioid dwarfed males have received attention from Regan (1925*a*) and from Parr (1930). The first complete account of the anatomy of a Ceratioid fish, however, is given by Waterman (1948) in his description of *Gigantactis longicirra*.

The following notes on the viscera of the new specimen are limited to what could be seen after a single median incision into the body cavity (Fig. 3).

The short wide oesophagus leads into a moderate stomach of somewhat caecal type. The cardiac stomach expands into equal pyloric and caecal portions, the latter being posterior. Externally the stomach appears compact, but its internal lining is strongly thrown into some twenty longitudinal folds. Doubtless this allows the stomach to accommodate large or numerous prey. Moreover, as Waterman has observed on *Gigantactis*, the coelom is large and has room for a distended stomach.

The duodenum leaves the stomach anteriorly and medianly, and passes right where it receives two pyloric caeca of somewhat unequal size. Kröyer mentions these two caeca in *Ceratias*, and it is interesting that Waterman found none in *Gigantactis*. At the junction of the pyloric caeca the duodenum expands to a wide, thin-walled tube which then receives the bile duct. The intestine passes back, suspended by its mesentery in overlapping loops, along the length of the stomach on the right-hand side until it narrows again, somewhat abruptly, level with the posterior end of the stomach. This narrower part, which presumably should properly be called the large intestine, is fairly long, and for the most part lies looped behind and above the stomach. It terminates in a short, straight, rectal portion. This gut differs from that of *Gigantactis* by its looped character and the inversion of the usual difference in size between small and large intestines. However, Waterman's specimen of *Gigantactis*, 3·9 cm. long, is doubtless an immature individual, and the relatively greater length of gut in *Ceratias* may probably be attributed to greater size and age rather than to a real morphological difference between the two genera.

The liver is of moderate size and bi-lobed. Waterman found an additional small third lobe in the liver of *Gigantactis*. The hepatic ducts of *Ceratias* unite to form a common duct which then divides into a large bile duct to the duodenum and a long and equally conspicuous cystic duct to the gall-bladder. This organ is large and lies dorsal to the stomach and posterior to the liver. *Ceratias* closely corresponds to *Gigantactis* in this arrangement.

The pancreas is a very finely diffuse, arborescent structure, lying in the mesentery between the hepatic portal vein and the gut. This agrees with Waterman's description of the pancreas in *Gigantactis*, except that in *Ceratias* it can be traced farther forward, beyond the hepatic portal, as far as the loop between the duodenum and the pyloric stomach. Posteriorly the pancreas of *Ceratias* is bounded by the posterior mesenteric and its associated intestinal vein.

The spleen is a subspherical body of median size, lying slightly forward of the bile duct in the mesentery between duodenum and liver. In *Gigantactis* Waterman found it below the posterior part of the intestine—a less typical position for the teleost spleen.

There is no swim-bladder. This confirms Kröyer's observation. Waterman, likewise, found no swim-bladder in *Gigantactis*, and the absence of this organ may well be characteristic of the Ceratioidea, as it is of many other groups of bathypelagic fishes (Rauther, 1937).

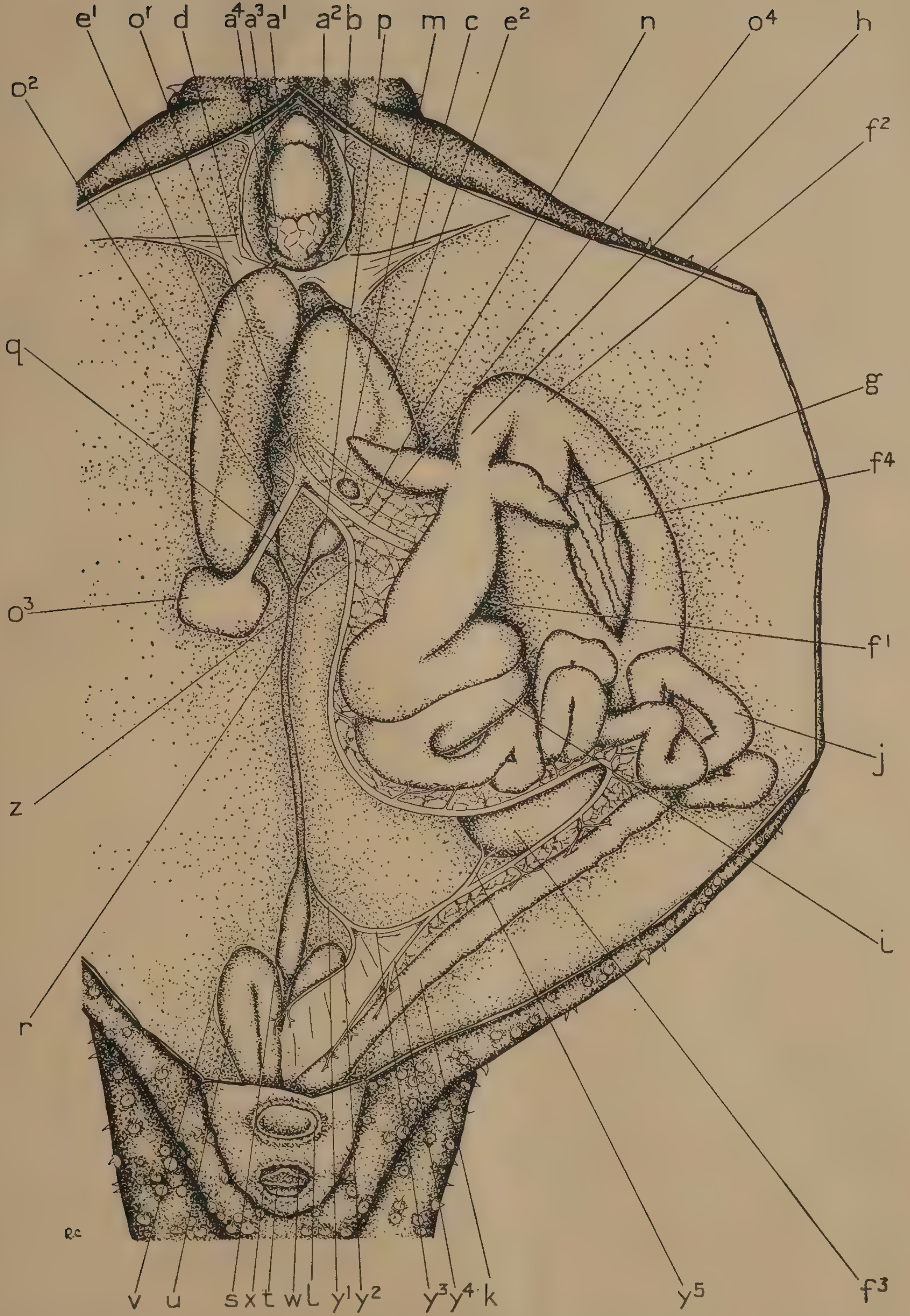

Fig. 3. *Ceratias holbölli* Kröyer. Viscera of the Antarctic specimen, × $\frac{7}{10}$. a^1, bulbus arteriosus; a^2, ventricle; a^3, auricle; a^4, sinus venosus; *b*, pericardium; *c*, pericardio-peritoneal septum; *d*, hepatic vein; e^1 and e^2, right and left lobes of the liver; f^1, f^2 and f^3, cardiac, pyloric and caecal parts of the stomach; f^4, stomach opened to show longitudinal folding of the gastric mucosa; *g*, pyloric caeca; *h*, duodenum; *i*, small intestine; *j*, large intestine; *k*, rectum; *l*, anus; *m*, spleen; *n*, pancreas in the intestinal mesentery; o^1, hepatic duct; o^2, cystic duct; o^3, gall bladder; o^4, bile duct; *p*, left kidney; *q*, left ureter; *r*, renal duct; *s*, urinary bladder; *t*, urinary aperture; *u*, right ovary; *v*, integument of right ovary; *w*, left genital aperture; *x*, urinogenital cloaca; y^1, posterior mesenteric vein; y^2, ovarian vien; y^3, gastro-intestinal vein; y^4, intestinal vein; y^5, gastric vein; *z*, hepatic portal vein.

2-2

The heart lies well forward in front of a marked pericardio-peritoneal septum. It is enclosed in a strong pericardium and exhibits the typical teleost form. A conspicuous bulbus arteriosus is separated from the large ventricle by a constriction. The visceral blood supply is remarkable for the share taken by the venal portal system in draining blood from the gut. The posterior mesenteric vein, at a junction where it receives gastric and intestinal tributaries, is directly confluent with the posterior part of the hepatic portal. An ovarian vein joins the posterior mesenteric which then receives the caudal vein, in the region of the urinary bladder, and continues forward to the kidneys as the renal portal vein. In this part of its course it is closely applied to the median renal duct. Waterman has noticed that in *Gigantactis* also, and in a similar way, the renal and hepatic portal systems compete for the venous drainage of the gut.

As Waterman found in *Gigantactis*, the kidneys of the new specimen of *Ceratias* lie far forward. They are compact organs, partly embedded in the dorsal body wall above the oesophagus. Their ureters join to form a single renal duct which posteriorly dilates somewhat into a tubular bladder. This opens as a generous transverse slit in the shallow urinogenital cloaca.

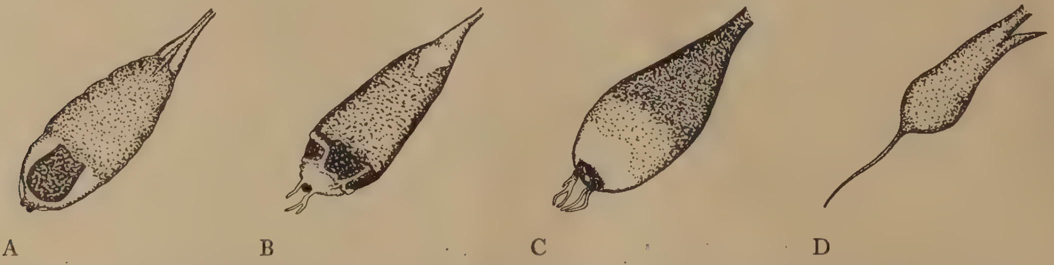

Fig. 4. *Ceratias holbölli* Kröyer. The esca, A, '*Mancalias bifilis*', ×18. B, '*Mancalias tentaculatus*', ×8½. C, Antarctic specimen, ×2¼. D, Kröyer's type, ×1⅙ (after Gaimard).

Waterman attributed to juvenility the smallness of the gonads in his specimen of *Gigantactis*. The size of the new specimen of *Ceratias* puts its sexual maturity beyond reasonable doubt (see p. 19), yet in this fish also the gonads are remarkably small. As all the ideas on the sexual dimorphism of these fishes would lead one to expect, these small gonads are indeed ovaries, and the sex of the specimen is confirmed. But microscopic examination of a teased fragment of the ovary revealed unripe, transparent eggs containing no yolk. Each consisted of a vitelline membrane enclosing a homogeneous cytoplasm which surrounded a large, central nucleus. The largest ova had diameters up to 16μ. The presence of small regressed ovaries, containing eggs in such a young stage of development, suggests a resting condition in an animal characterized by a well-defined and probably short breeding season. If this were general among the Ceratioidea, then it may be supposed that the solitary, sluggish and probably sparsely distributed females might well achieve and pass their sexual season before any free-living males happened to find them. Is it not therefore possible that a severely restricted breeding season may have been a major stimulus leading to the evolution of dwarfed males which become permanently attached to the females? If so, then the suggestion (Regan, 1925*a*; Parr, 1930, 1932) that the milting of the male may be under direct hormonal control from the female acquires added significance.

The ovaries exhibit the cystoarian condition, and are otherwise interesting in that each is strongly bent upon itself into a U-shape within its integument. Each opens separately to the exterior, and the paired genital openings are located within the shallow urinogenital cloaca immediately anterior to the transverse slit of the urinary aperture.

Regan's specimen had been gutted and no observations can be made upon its viscera.

It may be concluded that the visceral organs of *Gigantactis* and *Ceratias* are, in general, similar, differing principally in the presence of two pyloric caeca in *Ceratias*. Kröyer's remarks on the viscera of *Ceratias* are confirmed.

No internal or external parasites were observed in the Antarctic specimen.

THE GROWTH OF *CERATIAS HOLBÖLLI*

Apart from the single discrepancy in the number of escal filaments, the foregoing description and comparison establishes with fair certainty that the Antarctic specimen is, in fact, an adult of *C. holbölli* Kröyer.

Additional evidence is provided by an examination of the bodily proportions of this and other specimens in the genera *Ceratias* and *Mancalias*. Parr (1932), identifying two Ceratiids as *Mancalias uranoscopus* Murray, paid some attention to their proportions and attributed certain discrepancies to disparity of age. Later Bertelsen (1943) compared the proportions of eight specimens of Ceratiids, including species of *Ceratias* and *Mancalias*. Where there were disagreements in these measurements (expressed as percentages of the standard length) he followed Parr in emphasizing that they could be due to differences in size of the specimens. He concluded, therefore, that *Mancalias* and *Ceratias* could not be distinguished by measurement, so that there was nothing here to contradict his demonstration (based mainly on the mechanism of the cephalic tentacle) of the invalidity of the genus *Mancalias*.

The discrepancies that Parr and Bertelsen noticed are immediately explicable if there is any allometry of the proportions concerned. The investigation of allometry as a method in taxonomics has been stressed by Huxley (1932) and subsequently discussed by Worthington (1940) and de Beer (1940).

Accordingly, by substitution in the simple allometry formula* $y=bx^{\alpha}$, I have tested the measurements of the eight specimens tabulated by Bertelsen, and five additional specimens which are of significance in the systematics of the Ceratiidae.

Table 1 shows the measurements of thirteen specimens of the genera *Mancalias*, *Miopsaras*† and *Ceratias*. Besides the eight individuals previously tabulated by Bertelsen, the table includes Regan's specimen, the new Antarctic specimen and the type of *Mancalias sessilis* Imai, together with representatives of the two southern species; viz. the type of *M. tentaculatus* Norman and the smaller of the two existing specimens of *M. bifilis* Regan & Trewavas. I have been able to examine these last two specimens in the Natural History Museum Collection. The measurements record the size of 21 dimensions or parts in each specimen, but there are a few omissions. Dimensions are given as percentages of the standard length, and from these the actual measurements have been recalculated‡.

The values for each dimension have been plotted against standard length on a double logarithmic scale. The resulting graphs are shown in Fig. 5 (*a–u*). It will be seen that except for graphs *b* and *d*, the points for the graphs of each dimension give good agreement to a single straight line. In the last two graphs (*t* and *u*), viz. those for diameter of eye and length of nostril, there are admittedly only four points available, but the arrangement of these points strongly suggests a straight-line relationship, and their inclusion is justified by inference from the conformity of the remaining seventeen graphs. The appearances of graphs *b* and *d* are explicable and will be considered below. Apart from these, therefore, it is seen that, in the specimens under examination, all the recorded dimensions have values showing the straight-line relationship required by

$$\log y=\log b+\alpha \log x.$$

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* For terminology see Huxley & Teissier (1936) and Reeve & Huxley (1945).

† Regan & Trewavas (1932) included *Miopsaras* Gilbert 1903 with *Mancalias*.

‡ Except for nos. 1, 2, 9 and 12, where absolute measurements were directly available.

Table 1. Mancalias, Miopsaras *and* Ceratias *Spp.* *Dimensions* (*after Bertelsen*, 1943 *with additions*)

Dimension	1 *Mancalias bifilis* (Regan & Trewavas, 1932)	2 *Mancalias sessilis* (type Imai, 1941)	3 *Mancalias uranoscopus* (Parr, 1932)	4 *Ceratias uranoscopus* (type Murray, 1877)	5 *Mancalias tentaculatus* (type Norman, 1930)	6 *Miopsaras myops* (type Gilbert, 1903)	7 *Ceratias* n.sp. (Murray & Hjort, 1912)	8 *Ceratias holbölli* (Bertelsen, 1943)	9 New specimen from the Antarctic	10 *Mancalias uranoscopus* (Parr, 1932)	11 *Ceratias holbölli* (Saemundsson, 1939)	12 *Ceratias holbölli* (Regan, 1925)	13 *Ceratias holbölli* (type Kröyer, 1844)
Total length (cm.)	2·00	3·60	5·2	7·6	11·0	11·4	13	..	..	62	*c.* 100	97	119
Standard length (cm.)	1·60	2·80	3·8	6·0	7·8	8·1	9·8	18·5	43	48	65	67	68
% of standard length:													
(*a*) Length of illicium	34	28	..	23	27	..	27	24	16·2	..	14	..	*c.* 17
(*b*) Length of exserted part of basal bone	63	18	..	72	31	..	11	17	35	..	..	..	*c.* 83
(*c*) Total length of basal bone	97	..	..	..	101	..	70	93	79	..	80	..	..
(*d*) Height of caruncle, stalk included	4·4	4·6	5·5	6	7·7	5		2·7	1·4	1·04	0·7	0·6	*c.* 1
(*e*) Snout to base of tentacle	22	..	..	21	19·2	..	22	23	15·8	..	19·7	18·7	13·2
(*f*) Snout to dorsal fin	78	68	78	71	74	68	70	69	72	*c.* 76	71	70	*c.* 74
(*g*) Snout to anal fin	81	68	..	76	76	74	75	75	77	..	78	77	..
(*h*) Snout to base of pectoral fin	47	39	37	43	39	39	45	40	32	36	42	33	37
(*i*) Length of maxillary	18·8	..	19	21	19·9	21	..	17·3	14·4	13·4	14·2	13·1	12·2
(*j*) Length of lower jaw	22	..	24	..	23	22	20	18·2	17·9	15·6	17·9	16	17
(*k*) Greatest depth of body	38	43*	33	45	35	36	38	38	49	36	49	42	46·2
(*l*) Depth of caudal peduncle	12·5	12	8·5	11	9	9	9	8·1	9·3	5·3	10·8	9·4	7·8
(*m*) Base of tentacle on head to base of tentacle (papilla, pore) on back	44	..	..	..	44	40	33	36	43	..	38·5	40	32·6
(*n*) Dorsal fin to caudal fin	12·5	17*	13	16	16·6	16	16	17·3	13·9	13·4	13·3	13·4	16·6
(*o*) Anal fin to caudal fin	11·3	19*	13	15	16·6	16	17	16·8	13·9	9·2	12·5	13	11·5
(*p*) Base of tentacle (papilla, pore) on back to dorsal fin	22	..	14	..	12·8	13	12	12·4	14·9	18	13·7	14·8	13·8
(*q*) Posterior caruncle to dorsal fin	15·6	..	10	13	9·6	10	9·5	8·1	13·2	14	9·9	12·2	..
(*r*) Base of dorsal fin	9·4	11	9	9	9·0	12	13	10	10·7	10·4	10·2	15·4	9·6
(*s*) Base of anal fin	6·3	11	8·5	8	7·7	12	11	8·4	8·1	7·7	9·7	9·3	8·1
(*t*) Diameter of eye	2·5	..	..	..	1·36	..	..	..	0·81	..	..	0·6	..
(*u*) Length of nostril	2·5	..	..	..	2·27	..	..	..	2·09	..	..	1·19	..

The measurements of Nos. 4, 6 and 7 are 'approximate, based only on drawings of these specimens' (Bertelsen, 1943, p. 198).

* These three measurements are also approximate, being from Imai's figure (1941, p. 245).

I believe that this is good evidence that all the thirteen specimens considered belong to a single species, and that the differences between measurements for any particular dimension may be attributed to simple allometry.

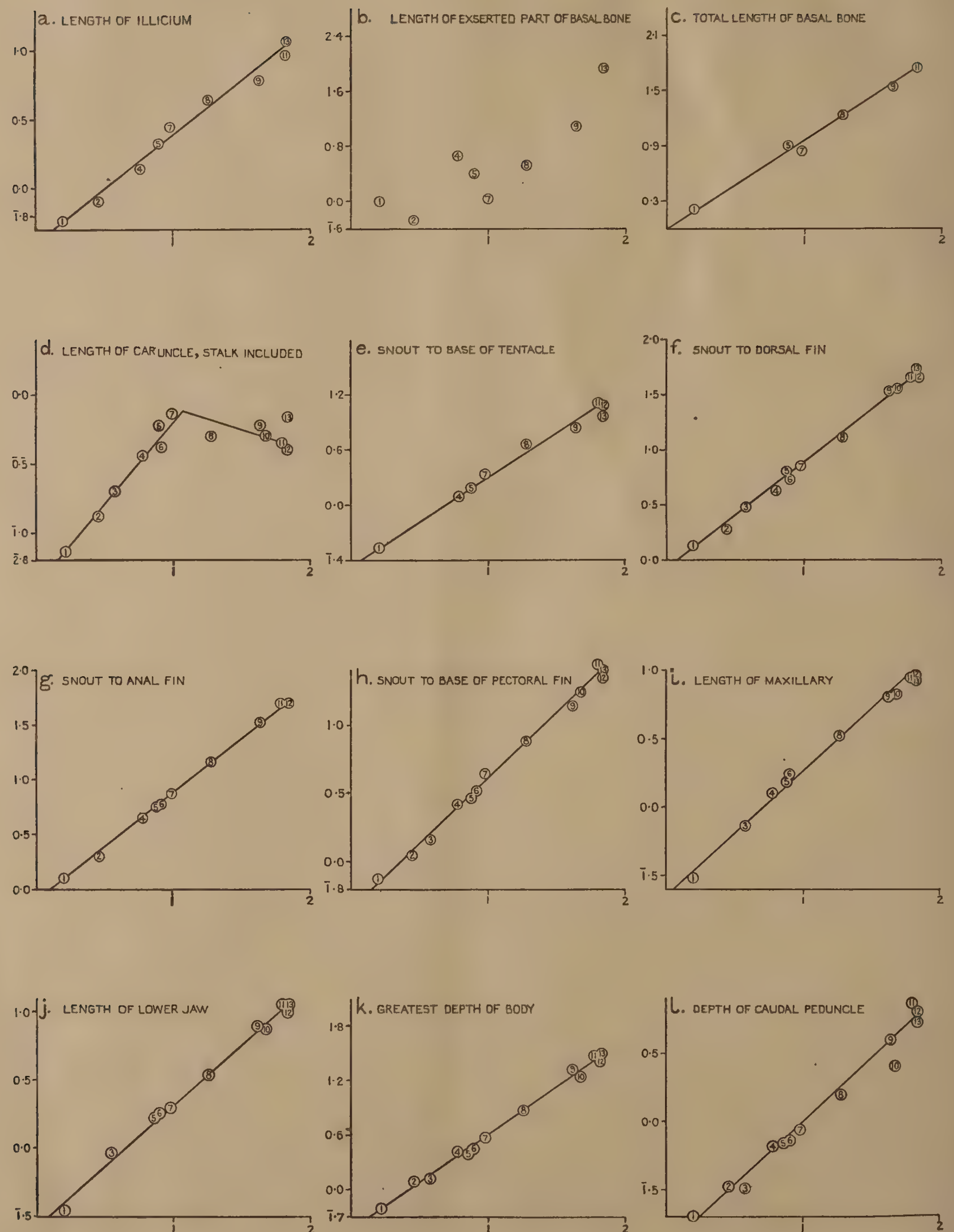
These graphs, therefore, provide a fairly complete picture of relative growth in *Ceratias holbölli* Kröyer from 1·60 to 68 cm. standard length, i.e. from juvenile to adult size. Accordingly, for each dimension the growth constant (α) has been measured (=tangent of the angle of slope of the straight line). Table 2 shows these growth constants.

It will be seen that in twelve of the dimensions (c, e, f, g, h, k, m, n, o, q, r, s) growth is isometric, i.e. $\alpha = 1 \pm 0{\cdot}05$. This group includes the dimensions relating to the positions of the dorsal and anal fins which Parr found to show small differences in his two specimens of *Mancalias uranoscopus* (Table 1, nos. 3 and 10). In the run of specimens now being examined the small differences are found not to be significant.

Regarding the same two specimens Parr also found that the following dimensions were relatively smaller in his larger specimen (no. 10): length of maxillary, length of lower jaw and depth of caudal peduncle. This is substantiated in Table 2, where these three dimensions (i, j and l) all show slight negative allometry ($\alpha = 0{\cdot}90 - 0{\cdot}92$). The distance of the base of the tentacle (papilla, pore) on the back, to the dorsal fin (p), is likewise slightly negatively allometric ($\alpha = 0{\cdot}92$). Parr's observation was the converse of this, a discrepancy due, as he suspected, to the damaged condition of his larger specimen.

The length of the illicium (a) shows marked negative allometry ($\alpha = 0{\cdot}78$). Bertelsen also drew attention to the decrease in length of the illicium and the jaws with increasing length of the individuals. Since the total length of the basal bone (c) remains isometric, it is likely that the pronounced decrease in the relative length of the illicium during ontogeny is associated with the negative allometry of the jaws (i and j), and perhaps with an increase in the distance that the basal bone can be retracted. The relative growth of the illicium would then be such as to keep the esca in line with a bisection of the angle of gape when the lure is retracted.

It will be seen that in *Ceratias holbölli* there is considerable reduction in two of the sense organs during growth to adult size. Data on the diameter of the eye (t) and the length of the nostril (u) are confined to the four specimens (nos. 1, 5, 9 and 12) which I have myself been able to examine. The points plotted on the log log scale are grouped sufficiently close to a straight line to advance values for the growth constants of about 0·6 for the diameter of the eye and 0·8 for the length of the nostril. It is significant that in *C. holbölli* the eye should show the greatest degree of allometry among the organs or dimensions investigated. It may be recalled that both the Antarctic specimen and Regan's specimen (nos. 9 and 12) are functionally blind. Now, in the two other specimens I have examined, viz. the second specimen of *Mancalias bifilis* Regan & Trewavas and the type of *Mancalias tentaculatus* Norman (nos. 1 and 5) which may now be regarded as juvenile *Ceratias holbölli*, the eyes, although reduced, are exposed and doubtless functional (Fig. 1*b*). It is clear therefore that the eyes, besides suffering reduction during ontogeny become also subcutaneous and acquire the condition of the eyes of the adult forms (nos. 9 and 12). A transparent disk, surrounded by a pigmented ring, has been mentioned lying just ventral to the concealed eye in the Antarctic specimen. This structure represents the conjunctiva of the eye in the juvenile fish, and the subcutaneous condition would have been achieved by the establishment of an active growth centre, at some stage in ontogeny, in the skin immediately above the eye. Such locally accelerated skin growth would then carry the conjunctiva and its pigmented border bodily across the eye and so conceal it. Even in the stage represented by '*Mancalias bifilis*' (no. 1) the shape of the aperture of the eye suggests that the occluding process may already have begun (Fig. 1 B). The final condition would be that found in the Antarctic specimen (Fig. 1 A). The fact that Gaimard's figure of the type specimen shows visible eyes does not by itself invalidate the argument. Their portrayal may be accountable to the artist, or to some damage of the material which revealed the eyes.


a. LENGTH OF ILLICIUM
1·0
0·5
0·0
1̄·8
1
2
b. LENGTH OF EXSERTED PART OF BASAL BONE
2·4
1·6
0·8
0·0
1̄·6
1
2
c. TOTAL LENGTH OF BASAL BONE
2·1
1·5
0·9
0·3
1
2
d. LENGTH OF CARUNCLE, STALK INCLUDED
0·0
1̄·5
1̄·0
2̄·8
1
2
e. SNOUT TO BASE OF TENTACLE
1·2
0·6
0·0
1̄·4
1
2
f. SNOUT TO DORSAL FIN
2·0
1·5
1·0
0·5
0·0
1
2
g. SNOUT TO ANAL FIN
2·0
1·5
1·0
0·5
0·0
1
2
h. SNOUT TO BASE OF PECTORAL FIN
1·0
0·5
0·0
1̄·8
1
2
i. LENGTH OF MAXILLARY
1·0
0·5
0·0
1̄·5
1
2
j. LENGTH OF LOWER JAW
1·0
0·5
0·0
1̄·5
1
2
k. GREATEST DEPTH OF BODY
1·8
1·2
0·6
0·0
1̄·7
1
2
l. DEPTH OF CAUDAL PEDUNCLE
0·5
0·0
1̄·5
1
2

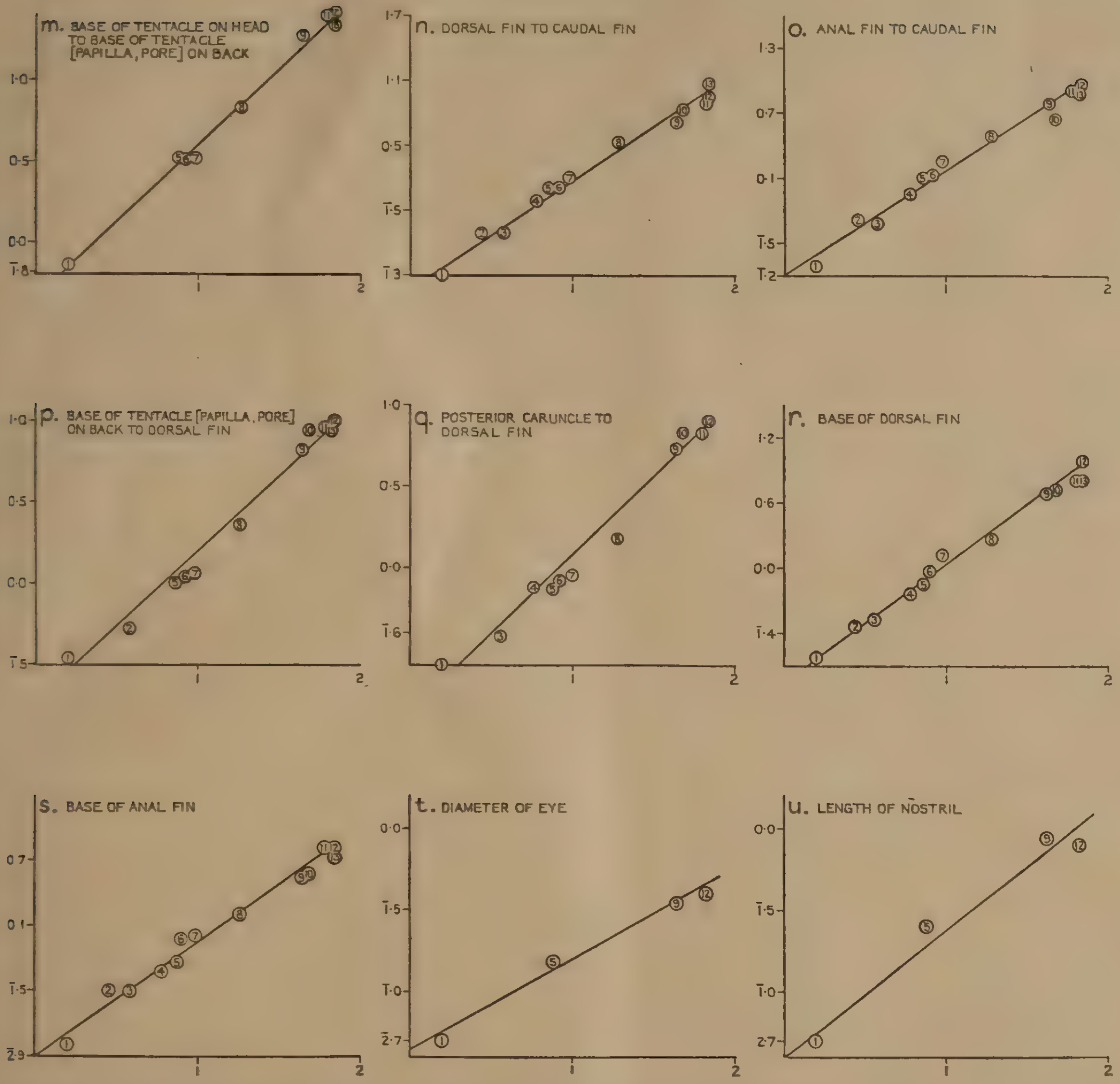


Fig. 5. (*a* to *u*). *Ceratias holbölli* Kröyer. Allometric growth. Dimensions of *Ceratias* and *Mancalias* spp. plotted against standard length on a double logarithmic scale. (The numbers refer to individual specimens recorded in Table 1.)

Ceratias holbölli is thus a blind fish in which the functional eyes of the young become reduced and then covered by opaque skin in the adult. There are certain other fishes which resemble *C. holbölli* in possessing eyes that are reduced and subcutaneous when adult, but functional in the juvenile stages. These are the Brotulids *Lucifuga* and *Stygicola*, and the goby *Typhlogobius* (Norman, 1931)

The degree of negative allometry of the nostrils in *Ceratias holbölli*, although not so great as that of the eyes, is nevertheless pronounced. In the juveniles '*Mancalias tentaculatus*' and '*M. bifilis*', these organs are fairly conspicuous, and it is curious that they appear to have previously been overlooked. They are hollow tubercles projecting on each side of the head, half-way between the eyes and the edge of the premaxilla (Fig. 1 B). In the adult *Ceratias holbölli*, as represented by Regan's and the Antarctic specimen, they become reduced, flattened and tag-like (Fig. 1 A). Although they still retain their lumen, it is probable that in this adult condition they are little or no better than useless vestiges. Even in the juvenile fish it is doubtful whether they are functionally efficient since Waterman found that in his specimen of the Ceratioid *Gigantactis longicirra*, which was probably a juvenile, the structure of the slender tubular nostrils and their innervation suggested to him that olfaction was unimportant.

Table 2. Ceratias holbölli *Kröyer. Growth constants* (α) *of the dimensions*

Part	Value of the growth constant (α) in $y = bx^{\alpha}$
(*a*) Length of illicium	0·78
(*b*) Length of exserted part of basal bone	—
(*c*) Total length of basal bone	0·97
(*d*) Length of caruncle, stalk included. Specimens 1–7	1·20
Length of caruncle, stalk included. Specimens 8–12	−0·34
(*e*) Snout to base of tentacle	0·98
(*f*) Snout to dorsal fin	0·99
(*g*) Snout to anal fin	1·00
(*h*) Snout to base of pectoral fin	0·98
(*i*) Length of maxillary	0·90
(*j*) Length of lower jaw	0·91
(*k*) Greatest depth of body	1·05
(*l*) Depth of caudal peduncle	0·92
(*m*) Base of tentacle on head to base of tentacle (papilla, pore) on back	0·96
(*n*) Dorsal fin to caudal fin	1·01
(*o*) Anal fin to caudal fin	0·98
(*p*) Base of tentacle (papilla, pore) on back to dorsal fin	0·92
(*q*) Posterior caruncle to dorsal fin	1·00
(*r*) Base of dorsal fin	1·04
(*s*) Base of anal fin	1·04
(*t*) Diameter of eye	0·6
(*u*) Length of nostril	0·8

It remains to consider the exceptional dimensions *b* and *d*. There is obviously no lineal or other relationship between the scattered points obtained on the log log graph of dimension *b*, the length of the exserted part of the basal bone. In view of the adjustability of the lure, this scattering is precisely what one would expect. Any appearance other than a random scattering would have seriously damaged Bertelsen's arguments for invalidating the genus *Mancalias*.

Both Parr and Bertelsen have stated that the relative size of the caruncles decreases strongly with increase in length of the individuals. Actually the growth of these curious organs is somewhat more complicated, and the comments of these authors require modification. The log log graph of caruncle length (*d*) shows that growth of this organ in *small* individuals (nos. 1–7) is not negatively allometric as Parr & Bertelsen implied. Rather there is marked positive allometry ($\alpha = 1{\cdot}20$) at this stage, and it is noteworthy that the young caruncle is the only organ or dimension in the growth of *Ceratias holbölli* which shows significant positive allometry.

A slight error in the measurement of a comparatively small dimension like caruncle length becomes magnified when plotted on a logarithmic scale of this kind. Remembering this it is seen that five of the six remaining points can be represented by a second straight line. The last point (no. 13) refers to the caruncles of Kröyer's type and is an approximation calculated from the somewhat vaguely delimited caruncle in the figure of the type in Gaimard (1842–56, Poissons, pl. ix). Under these circumstances it would appear reasonable to ignore it. The caruncles of all the specimens are now accounted for.

At the point of intersection of the two lines, the growth constant changes abruptly to $\alpha = -0{\cdot}34$. This change in sign of the growth constant means that at a period corresponding to an individual of 12 cm. and of caruncle size 0·75 cm. (Fig. 5 D) the growth of the caruncle changes abruptly from positive allometry to *enantiometric* (i.e. absolute negative) growth. From this point onwards during ontogeny the *absolute* size of the caruncles decreases.

True negative growth of this kind has been observed, for instance, in the abdominal limbs of crabs at, and shortly after, metamorphosis (Huxley & Teissier, 1936). The association in this instance with metamorphosis, and its abrupt and unique occurrence in the growth pattern of *C. holbölli*, suggests that the onset of enantiometry betrays a crisis in the development of the organism. In *C. holbölli* this crisis is most likely to be sexual maturity which would then be attained when the fish reaches 12 cm. standard length. Bertelsen (1943, p. 202, fig. 5) divides adult specimens of *C. holbölli* from juveniles at the presumably arbitrary figure of 15 cm. *total* length, and it is interesting that this value should virtually correspond with the one obtained from the log log curve.

If enantiometry of the caruncles does indeed coincide with sexual maturity, then these organs probably have some kind of sexual significance. Rauther (1941) has shown that the caruncles are luminous. In the darkness of the deep sea it is to be supposed that the female *C. holbölli* possesses some luminous device to which the free-swimming males of the species may be instinctively attracted. Parr (1932) suggested that the illicial esca might attract in this way. Now Waterman (1948), considering the Ceratioidea generally, has further discussed Parr's suggestion, and has pointed out that, since the structure of the esca differs considerably between, and even within, many genera of Ceratioids, the free-swimming males may thus have been enabled to discriminate between females of different genera or species. The objection to this view in *C. holbölli* is, of course, that the male is likely to be swallowed as prey by the blind female, unless the latter possesses chemoreceptors capable of detecting the proximity of a male. In the seeing Ceratioid *Gigantactis* this arrangement is possible, since Brauer (1908) has found sensory endings in the esca which are apparently gustatory; moreover, Waterman has stressed the considerable sensory innervation of the esca in this form. But these sensory nerves are most likely associated with the bunch of filaments characterizing the esca of *Gigantactis*, whereas in *Ceratias holbölli* the filaments are reduced to a vestige. Also *Gigantactis* lacks caruncles which are a feature peculiar to the Ceratiidae. It is probable, therefore, that here the caruncles, and not the esca, function as the luminous recognition mark for the male. Beebe & Crane (1947) observed a moribund specimen of '*Mancalias uranoscopus*' immediately after capture, and noted that the caruncles moved slowly back and forth alternately. So it may be that luminosity of the caruncles is combined with a characteristic signalling movement.

Since the caruncles may be supposed to reach their absolute maximum size and presumably maximum luminosity at sexual maturity, it follows that the males would have the best chance of finding the females round about that time. A male is therefore likely to become attached early in the female's sexual life, but her chance of securing a male after sexual maturity would become progressively smaller as she grows larger. In this respect it is interesting that, among the fourteen individuals over 12 cm. standard length, and therefore supposedly adult (Table 3), only three had dwarfed males attached to them.

The change in shape of the caruncle during ontogeny is shown in Fig. 2A, B and C. In the juvenile there is a marked differentiation into a head and a stalked region. At a later period, presumably after the onset of enantiometry, the club shape becomes progressively less pronounced, until the aged individual may bear completely sessile caruncles which are reduced to mere black prominences among the spines of the back. Fig. 2 also shows how the caruncles become gradually separated as growth proceeds, although the right caruncle always remains slightly anterior to the left. Terminal pores are apparently characteristic of the caruncles at all stages, since they were present in all the four specimens I examined (nos. 1, 5, 9 and 12). They suggest an open type of luminous gland, resembling that of the esca.

It would be interesting to undertake the histological examination of caruncles derived from a series of juvenile and adult *Ceratias*. This should reveal changes of structure, and possibly function, which could be compared with the present inferences based on measurement only.

THE SYSTEMATICS OF *CERATIAS*

When Bertelsen had demonstrated, by his work on the fishing lure, the invalidity of the genus *Mancalias* Gill, and so reduced the Ceratiidae to the genera *Cryptosparas* and *Ceratias*, he reviewed the species of the latter genus in a synopsis* reproduced below:

Ceratias Kröyer 1844

Illicium with long slender stem. Two caruncles.

1. Bulb of illicium in adult specimens with one filament	**holbölli**
(*a*) Dorsal fin concealed under skin, stalked caruncles	sub sp. **xenistius**
(*b*) Dorsal fin of normal structure, sessile caruncles	sub sp. **sessilis**
(*c*) Dorsal fin of normal structure, stalked caruncles	sub sp. **holbölli**
2. Bulb of illicium with a pair of filaments	**tentaculatus**

This synopsis may now be re-examined and further simplified.

Apart from *xenistius*, all the forms here set down have been investigated, either as types or representatives, in the previous section on the growth of *C. holbölli*. Of 21 dimensions investigated for allometry in each, the results, without exception, are consistent with the conclusion that these forms are all either juveniles or adults of a single species. It is relevant here to notice an observation of de Beer (1940, p. 380), who, referring to species with allometric organs, stated: 'whilst there is in such cases inconstancy of *form*, there is constancy of *form-change* and this, measured by the value of the growth constant α, is also a specific character.'

Assessing the members of Bertelsen's synopsis in order, it appears that the first, *C. holbölli xenistius*, should remain as a subspecies for the time being. Regan & Trewavas (1932) described this form as *Mancalias xenistius* from a single specimen. The dorsal fin was most unusual, being virtually concealed and only appearing externally as (p. 99), 'a series of four pores which are the openings of black glands'. Possibly this is a teratological specimen.

The subspecies *sessilis* was described by Imai (1941) as *Mancalias sessilis* and distinguished by the absence of a stalk to the caruncles. Imai gives a list of measurements, and this form appears in Table 3 and Fig. 5 as no. 2. There are no discrepancies. With regard to the caruncles, it is seen (Fig. 5D) that their length fits the simple allometry equation for sexually immature individuals. They are pear-shaped in appearance because their stalks are less constricted than those of the club-shaped caruncles of other specimens. This is doubtless a minor individual variation and cannot be assigned subspecific rank.

Bertelsen's reference to 'stalked' or 'sessile' caruncles in his synopsis appears to be due to a confusion of Imai's meaning. It has been shown in the previous section that, because of enantiometry in adult life, the caruncles may become truly sessile in the ageing individual (e.g. Regan's specimen of *Ceratias holbölli*). Previous to this late ontogenetic change, the caruncles of all members of the genus are characteristically more or less pedunculate, and reference to 'stalked' as distinct from 'sessile' caruncles is misleading in a taxonomic context. The revised species *C. holbölli* now consists of the two subspecies *xenistius* and *holbölli* only.

Bertelsen's second species *C. tentaculatus* includes *Mancalias tentaculatus* Norman, 1930 and *Mancalias bifilis* Regan & Trewavas, 1932. These two species had been distinguished from each other

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* As published, Bertelsen's synopsis contained typographical errors which have been corrected by reference to his text.

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by the difference in length of their dorsal tentacles, and Bertelsen, by his work on the adjustability of the lure, has shown that this is not a real distinction. However, he has separated them from *Ceratias holbölli* because they comprise the only specimens of *Ceratias* hitherto caught in southern waters beyond the tropics, and because they have two filaments on the illicial esca.

There are, at present, three individuals of Bertelsen's *C. tentaculatus*. They are the holotype of *Mancalias tentaculatus* (standard length 7·8 cm.), the type of *M. bifilis* (7.5 cm.), and the small fish 1·6 cm. which Regan & Trewavas (1932, p. 100) have stated 'may belong to this species'. Of these the first and third are preserved in the Collections of the British Museum (Natural History), where I have been able to examine them. In Table 3 and Fig. 5 they are included as nos. 5 and 1 respectively. The type of *M. bifilis* had been returned to Copenhagen and was not available to me. According to Bertelsen's classification, the new Antarctic specimen (no. 9) would be regarded as the adult of *C. tentaculatus*, the other individuals being juveniles.

In discussing the validity of this species, it may be said, at once, that in the two small individuals (nos. 1 and 5) there are no differences from *C. holbölli*, excepting perhaps the number of filaments on the esca, which cannot be attributed to juvenility. The fate of their exposed eyes and tubular nostrils, undergoing marked negative allometry, has already been noticed, together with the conformity of their other bodily proportions to the simple allometry equation. Of other features, the pectoral fin in each specimen has seventeen rays. Kröyer's type of *C. holbölli* and the Antarctic specimen had nineteen rays in the pectoral fin, Regan's specimen eighteen and Bertelsen's two specimens had seventeen each. As in the adult fishes, the number of teeth varies, being $\frac{7}{30}\cdot\frac{7}{30}$ in the specimen of *Mancalias bifilis* and *c.* $\frac{13}{15}\cdot\frac{13}{15}$ in *M. tentaculatus*, and this is not considered significant. The lateral line organs on the head of the Antarctic specimen are found also in *M. tentaculatus*, where they are more extensive, continuing above the eye and then down the body as far as the caudal peduncle. They were not observed in the much smaller specimen of *M. bifilis*.

Bertelsen's first reason for recognizing *Ceratias tentaculatus* as a new species is that the three individuals comprising its synonyms, *Mancalias tentaculatus* and *M. bifilis*, are the only three specimens of *Ceratias* hitherto taken in waters south of the tropics. So few specimens of *Ceratias* are known that this implication of a discontinuous distribution is neither supported nor disproved by his chart (Bertelsen, 1943, p. 202), which, equally well, suggests that specimens of the genus may be distributed without interruption through the oceans.

The morphological feature of an esca bearing two filaments, supposed by Bertelsen to be a second character distinguishing the southern form, is certainly present in the new adult specimen from the Antarctic (Fig. 4C), and in the types of *Mancalias tentaculatus* (Fig. 4B) and *M. bifilis*. But in the remaining (fourth) southern specimen, viz. the smaller specimen of *M. bifilis* (no. 1), there is only a slight rudiment to represent the filament or filaments (Fig. 4A). The esca of this specimen resembles that of the juveniles '*M. sessilis*' and '*M. uranoscopus*'. Bertelsen, who attributed the naked esca of *M. uranoscopus* to juvenility, requires that in his classification the northern form should possess only one escal filament in the adult. But of the thirteen known adults of *Ceratius holbölli* from northern waters, the escas of only two are definitely known to bear one filament, viz. Kröyer's type and Bertelsen's Greenland specimen (Bertelsen, 1943). In all the other northern adults the cephalic tentacle has either been damaged, lost or not described.

It is not, therefore, considered that the descriptions and material at present available are sufficient to justify any splitting of the single species apart from the tentative isolation of the anomalous *xenistius* as a subspecies. It may be, indeed, that Bertelsen is correct and that the escal filaments are a subspecific character absent in the small forms but appearing in later juveniles and adults, and distinguishing a northern form with one filament from a southern form with two. Only the collection of further specimens can decide this point. It is, in any case, doubtful whether even a grouping of subspecific rank has any validity when erected on the distinction of such a single, slight and isolated feature, and in the face of so many characters which conform.

In the synopsis below the genus is reduced to a single species

Ceratias Kröyer, 1844

Illicium borne on long slender pterygiophor. Adult esca with one or two filaments only. Two caruncles holbölli
(*a*) Dorsal fin of normal structure subsp. holbölli
(*b*) Dorsal fin concealed under skin subsp. xenistius

Bertelsen's synonymy is revised and extended as follows:

Ceratias holbölli holbölli

Ceratias holbölli Kröyer, 1844, p. 639, and in Gaimard, 1842–56, Poissons, pl. ix, *et auctorum.*
Ceratias uranoscopus Murray in Thomson, 1877, p. 70, fig. 20; Günther, 1887, p. 54, pl. xi, fig. *c.*
Ceratias shufeldti Günther, 1887, p. 54.
Mancalias uranoscopus Gill, 1878, p. 227; Goode, 1880, p. 469; Jordan & Gilbert, 1882, p. 848; Goode & Bean, 1895, p. 490; Regan, 1926, p. 37; Regan & Trewavas, 1932, p. 99; Parr, 1932, p. 13; Norman, 1939, p. 116; Beebe & Crane, 1947, p. 169.
Mancalias uranoscopus triflos Roule & Angel, 1933, p. 57, pl. iii, fig. 27.
Mancalias shufeldti Goode & Bean, 1895, p. 490, fig. 401.
Typlopsaras shufeldti Gill, 1883, p. 284; Jordan, 1885, p. 138.
Miopsaras myops Gilbert, 1903, p. 694, pl. xlix.
Mancalias sessilis Imai, 1941, p. 233, fig. 12.
Mancalias tentaculatus Norman, 1930, p. 355, fig. 45; Regan & Trewavas, 1932, p. 100.
Mancalias bifilis Regan & Trewavas, 1932, p. 100, pl. vi, fig. 1.
Ceratias tentaculatus Bertelsen, 1943, p. 203.

Ceratias holbölli xenistius

Mancalias xenistius Regan & Trewavas, 1932, p. 99, pl. vi, fig. 2.

THE DISTRIBUTION OF *CERATIAS HOLBÖLLI*

Bertelsen has pointed out that the oceanic expeditions have never taken large adult specimens of *C. holbölli*. All these have come from the coastal waters of Iceland, Greenland and Nova Scotia. Consequently, until Bertelsen identified the juveniles of *C. holbölli* and showed them to be more widely distributed, the species was generally supposed to be a northern form which, unlike most Ceratioids, was not markedly of bathypelagic and oceanic habit. Bertelsen found this view no longer tenable and, regarding the absence of adults from oceanic collections, concluded 'the reason is, no doubt, that the gear hitherto used for bathypelagic fishing has not been able to capture these larger individuals'.

The new specimen of *C. holbölli* was removed from a Sperm whale shot in mid-ocean in a high southern latitude. It is thus the first adult specimen from oceanic waters, and its manner of capture substantiates the correctness of Bertelsen's observation. It is some years since Hjort (1912, p. 36) remarked '...the whale is still far more capable of catching living marine creatures than any scientific appliance hitherto invented'. This is no less true to-day, although possible methods of the future have been discussed by Kemp *et al.* (1939). Meanwhile it is well again to stress that routine exminations of the stomach contents of Sperm whales can do much to increase our scanty knowledge of the nektonic macrofauna. The results may suggest that some bathypelagic Squids and fishes are more common and achieve greater sizes than is at present supposed.

When the new specimen was found, the floating factory was in position 61° 20′ S, 102° 50′ E, and the sperm whale must have been shot within, at most, 100 miles radius of this position because the whale-catchers never steamed farther than this distance from the factory during the season. The area (200 miles in diameter) is not only well within the limits of the Antarctic Convergence (Mackintosh, 1946, pl. i) but also within the limits of the pack-ice (Mackintosh & Herdman, 1940, pl. lxxv), so that the specimen may properly be said to be Antarctic in origin. The chart shows soundings within this area varying from 4260 to 4400 m. which means that the sperm whale must have taken the fish at some level in water which was at least 4260 m. deep. There is evidence that a Sperm whale may sound to 500 fathoms or 900 m. (Laurie, 1933) but it is possible, as will be seen later, that the fish may have been captured at a quite shallow depth.

Table 3. Ceratias holbölli *Kröyer. Distribution of known specimens*

Specimen	No. on Chart	Recorded by	Locality	Position	Depth of haul in metres or metres of wire out
ADULT > 12 cm. standard length					
Ceratias holbölli	1	Kröyer (1844) (type)	Greenland	—	330
Ceratias holbölli	2	Lutken (1878)	Greenland	—	—
Ceratias holbölli	3	Lutken (1878)	Greenland	—	—
Ceratias holbölli	4	Goode & Bean (1895)	Nova Scotia	—	—
Ceratias holbölli	5	Saemundsson (1922)	Selvogsbanken, Iceland	—	140
Ceratias holbölli	6	Saemundsson (1922)	Selvogsbanken, Iceland	—	120
Ceratias holbölli	7	Regan (1925)	Iceland	—	—
Ceratias bolbölli	8	Schnakenbeck (1936)	Ingolfhöfdi, Iceland	—	—
Ceratias holbölli	9	Saemundsson (1939)	Kolluáll, Iceland	—	240
Ceratias holbölli	10	Rauther (1941)	—	—	—
Ceratias holbölli	11	Rauther (1941)	—	—	—
Ceratias holbölli	12	Bertelsen (1943)	West Greenland	—	—
Ceratias holbölli	13	Not previously recorded	Antarctic (Indian Ocean Sector)	Within 100 miles radius of 61° 20′ S, 102° 50′ E	?
Mancalias uranoscopus	14	Parr (1932)	Georges Bank, New England	—	—
JUVENILE < 12 cm. standard length					
Ceratias n.sp.	15	Murray & Hjort (1912)	Atlantic, near Canaries	28° 02′ N, 14° 17′ W	—
Ceratias uranoscopus	*16	Murray (1877)	Atlantic, North of Cape Verde Is.	22° 18′ N, 22° 02′ W	4400
Typlopsaras shufeldti	*17	Gill (1883)	New England	—	—
Miopsaras myops	*18	Gilbert (1903)	Kauai I., Hawaii	*c.* 22° N, 160° W	900–1000
Mancalias uranoscopus	*19	Goode (1880)	Off south coast of New England	—	590
Mancalias uranoscopus	20	Regan (1926)	Caribbean Sea, near St Croix	17° 43′ N, 64° 56′ W	1000
Mancalias uranoscopus	21	Regan (1926)	Caribbean Sea, near St Croix	17° 13′ N, 64° 58′ W	4500
Mancalias uranoscopus	22	Regan (1926)	Atlantic	7° 22′ N, 46° 51′ W	600
Mancalias uranoscopus	23	Regan & Trewavas (1932)	South China Sea	19° 19′ N, 120° 13′ E	2000
Mancalias uranoscopus	24	Regan & Trewavas (1932)	North of Moluccas	4° 10′ N, 127° 44′ E	800
Mancalias uranoscopus	25	Regan & Trewavas (1932)	Indian Ocean, off Sumatra	3° 06′ S, 99° 15′ E	700
Mancalias uranoscopus	26	Regan & Trewavas (1932)	Indian Ocean	5° 18′ N, 90° 55′ E	3500
Mancalias uranoscopus	27	Regan & Trewavas (1932)	Atlantic	7° 34′ S, 8° 48′ W	2000–0
Mancalias uranoscopus	28	Norman (1939)	Arabian Sea	9° 42′ N, 54° 39′ E	2091–0
Mancalias uranoscopus	29	Beebe & Crane (1947)	Pacific, south of Cocos I.	4° 50′ N, 87° 00′ W	1370
Mancalias uranoscopus	30	Beebe & Crane (1947)	Pacific, south of Cocos I.	4° 50′ N, 87° 00′ W	1280
Mancalias uranoscopus	31	Beebe & Crane (1947)	Pacific, off Galapagos Is.	0° 17′ S, 91° 34′ W	910
Mancalias uranoscopus	32	Beebe & Crane (1947)	Pacific, off Galapagos Is.	0° 17′ S, 91° 34′ W	910
Mancalias uranoscopus triflos	33	Roule & Angel (1933)	Atlantic, Sigsbee Deep	40° 15′ N, 56° 25′ W	0–4000
Mancalias sessilis	34	Imai (1941)	Sagami Sea, east of Hasima	*c.* 35° N, 140° E	1220–0
Mancalias tentaculatus	35	Norman (1930)	South Atlantic	52° 25′ S, 9° 50′ E	650–700
Mancalias bifilis	36	Regan & Trewavas (1932)	East of Dunedin, New Zealand	46° 43′ S, 176° 09′ E	3000
Mancalias bifilis	37	Regan & Trewavas (1932)	Indian Ocean, east of Delagoa Bay	25° 18′ S, 36° 13′ E	2500
Mancalias xenistius	38	Regan & Trewavas (1932)	South China Sea	8° 02′ N, 109° 37′ E	1000

* Regan (1926) and Regan & Trewavas (1932) give *Mancalias uranoscopus* for nos. 16–19 inclusive.

HORIZONTAL DISTRIBUTION

The geographical distribution of *C. holbölli* is shown in Table 3 and Fig. 6. Bertelsen considered that *C. holbölli* was widespread in the tropical and subtropical parts of the ocean, but reserved his *C. tentaculatus* for more southern latitudes. Regan & Trewavas (1932, p. 13) similarly considered that

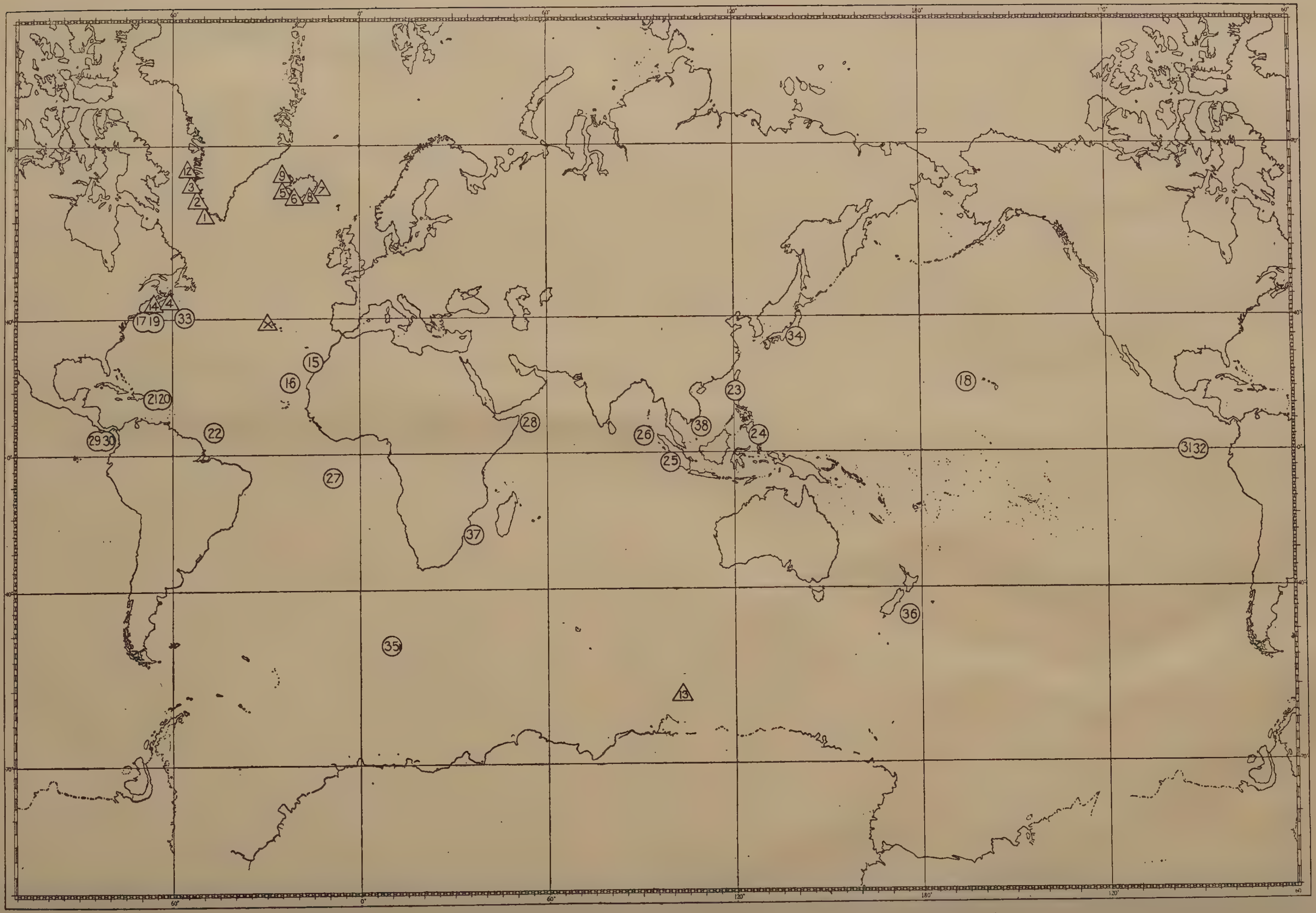
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Fig. 6. *Ceratias holbölli* Kröyer. Horizontal distribution: adults △, juveniles ○, Azores record ▲.

'*Mancalias uranoscopus*' was replaced in the south by distinct species. It is now seen that the single species *Ceratias holbölli* is a cosmopolitan form, dwelling in all the oceans and extending into polar latitudes, both north and south. A remark of Regan's referring to the Ceratioidea generally (1926, p.10) may be recalled: '...it would be unsafe to predict that any species would not turn up anywhere.'

VERTICAL DISTRIBUTION

Regan & Trewavas (1932) and Gregory & Conrad (1936) both give the vertical distribution among Ceratioidea as 500–1500 m. Waterman (1938) extends the lower limit to 5000 m. However, with regard to *C. holbölli*, there appears no definite evidence that the species extends below 1000 m. In Table 3, the data showing depth of haul in metres, or metres of wire out, gives figures down to 4400 m.; but on only two occasions can one be certain that closing nets were used and that the specimens were not taken at some intermediate depth when hauling in the gear. Of these two hauls, the deeper was made in the tropical latitude of Hawaii (22° N) at 900–1000 m. when specimen no. 16 (Table 3 and Fig. 6) was obtained. The upper limit of the range is to be found in high northern latitudes off the coasts of Iceland and Greenland, where fishing trawlers took at least nine of the thirteen adults recovered from the northern hemisphere. Soundings are only available in connexion with four of these trawled fish; they were taken in water between 330 and 120 m. deep (Table 3). Any of these specimens may, of course, have been captured somewhere between these depths and the surface. That such fishes, taken in comparatively shallow water, were probably not moribund nor 'out of their depth', is suggested by the presence of a freshly swallowed *Gadus esmarki* in the stomach of one of them (Saemundsson, 1922). This appears to indicate a normal feeding migration.

The known bathymetric range of *Ceratias holbölli* is thus from 1000 to 120 m. or less from the surface. This range implies a tolerance of extensive changes in hydrostatic pressure which the fish, lacking the embarrassment of a swim-bladder, would appear well fitted to possess.

TROPICAL SUBMERGENCE

The presence of *C. holbölli* so near to the surface in high northern (and possibly southern) latitudes can be explained, as in the case of certain other bathypelagic fishes, by the phenomenon of tropical submergence (Hjort, 1912, p. 623; Sverdrup, Johnson & Fleming, 1942, p. 849). This would also account for the widespread distribution of the fish and its vertical range. *C. holbölli* in the high latitudes of both hemispheres probably has a normal vertical distribution from considerable depths nearly to the surface, but its upper limit is increasingly submerged with approach to the equator. Table 3 shows that in the tropics it has been taken at 900 to 1000 m., but it has never in such latitudes appeared in a haul made from less than 600 m. Probably, for any one latitude, its known vertical range of around 1000 m. is only attained in the polar seas, north and south. When near the surface in these regions it would be normally over the deep ocean, which explains why it has been so seldom captured by the Arctic trawlers, since they fish only the neritic seas and would only take occasional specimens which have strayed on to the continental shelf.

Tropical submergence is usually attributed to the distribution of temperature and (to a lesser degree) of light, in the ocean. Viscosity is doubled by a 25° C. fall in temperature (Sverdrup *et al.* 1942, p. 69), and it has been pointed out that the viscosity of the water is important in limiting the vertical distribution of certain copepods and small bathypelagic fishes (Hjort, 1912, p. 698; Coe, 1946). With regard to *C. holbölli* it can be argued that even a fish of this size is perhaps limited to water of high viscosity, because its sluggish habit requires an environment which will allow maximum support with the least expenditure of muscular activity. The sluggish habit is suggested by the clumsy shape of the fish, its poorly developed body musculature and the condition of the fins; of the latter, the pelvics are absent, the pectorals much reduced, and the caudal, although large, yet palmate and weakly constructed.* Such a fish might, in low latitudes, be confined to the deeper cold water; towards the poles, where the temperature differs little throughout the water column, it could approach nearer to the surface.

Light intensity as a barrier to vertical range may, in this context, be even more important. Hjort (1912, p. 664) has written 'in different waters the upper limit for black fish and red crustaceans seems to coincide with the same low intensity of light', and Sverdrup *et al.* (1942, p. 851) have also noticed this direct effect of light upon certain bathypelagic organisms. The reduction and effective concealment of the eye during the ontogeny of *C. holbölli* strongly suggests that the fish is nicely adjusted to the intensity of light in its environment. It is probably adapted to surroundings of near or complete darkness, and consequently must suffer submergence in the tropics, but could rise much nearer to the surface, from the bathypelagic to the mesopelagic zone, progressively farther north and south as the intensity of illumination decreases. There is also the possibility of a superimposed diurnal rhythm which would bring the fish nearest to the surface at night.

With regard to this matter there exists direct evidence that, in a high latitude, a bathypelagic fish can make an apparently normal feeding migration to within a few feet of the very surface of the ocean. For this information I am indebted to Dr N. A. Mackintosh, who observed the fish at St. WS 540, on 27 January 1931, when the R.R.S. 'William Scoresby' lay alongside pack-ice east of the South Sandwich Islands in 57° 55′ S, 21° 21′ W. This was in the region of the South Sandwich Trench over water between 4000 and 5000 m. deep. In the 17th Scientific Report from the 'William Scoresby', 1931 (unpublished), Dr Mackintosh records:

'It is noteworthy that during the night, when the ship was stopped and the wind fallen away, an eel-shaped Stomiatoid fish, with brilliant luminous organs and silvery scales, was feeding on the krill close to the surface, and could be plainly seen by the light of a cargo cluster. We attempted to catch it with a hand net, but without success.'

The Biological Deck Log contains a further note by the late E. R. Gunther describing the feeding activity. Although not strictly relevant it seems worth recording here.

'From a pair of luminous organs in the orbital region, the fish (which was 9–12 inches in length) emitted a beam, of varying intensity, of strong blue light which shone directly forwards for a distance of about two feet. The fish had the habit of lurking at a depth of 2–6 feet below the surface, poised at an angle of about 35–40° from the horizontal—this gave the beam an upward tilt: occasionally the fish swam round and with a quick action snapped at the cloud of krill above it.

'In its manner of lurking and of snapping prey it resembled the freshwater pike. From the anal region was seen to trail a length of brown substance which, it was supposed, might have been either genital or faecal product.'

Bertelsen has noticed that several large representatives of the genera *Himantolophus*, *Oneirodes* and *Cryptopsaras*, all of them known to have a more southerly distribution, have been recorded from water over the continental shelf of Iceland and Greenland. Tropical submergence, therefore, may be a feature of some other members of the Ceratioidea.

DISTRIBUTION AND OCEAN CURRENTS

Bertelsen, however, has advanced an explanation opposed to that of tropical submergence in order to explain the presence of *Ceratias holbölli* and the other Ceratioids just mentioned, in the shelf water of high latitudes. He considers that these large specimens are carried northward by the North Atlantic Current until they meet the Polar Current when they are forced by the cold bottom water to seek lesser depths and thus come within the range of the trawlers. Bertelsen, in fact, considers that *C. holbölli* is limited to comparatively warm water. Against this is set the capture of the Antarctic specimen in a water column which varies between limits of no more than 0·5 and 2° C. throughout its entire length. Moreover, at stations where *C. holbölli* has been taken, the only available temperature record at the level of a closing net haul, and therefore reliable in this context, is that for specimen 35, (Table 3, Fig. 6). This specimen, '*Mancalias tentaculatus*' Norman, was caught between 650 and 700 m. when the temperature recorded at 745 m. was 2·08° C. (*Station List*, 1929). According to Sverdrup *et al.* (1942, p. 658), the deep water of the North Polar Sea has a uniform temperature of about −0·85° C. However, the most northerly of the specimens from the coast banks came from west Greenland and were taken apparently south of the submarine ridge across the Davis Strait. The bottom water in this area is nowhere less than 1·7°, and the greater part of the column lies between 3·5 and 3·0° (Sverdrup *et al.* 1942, p. 663). Therefore, by comparison with the southern specimens, it does not seem likely that the specimens caught on the northern coast banks were there because they had been forced up by cold water.

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* Waterman (1948) notices similar characters in the Ceratioid *Gigantactis*, and, in its brain structure, finds further evidence of weakly developed locomotor activity.

Bertelsen supports his argument by reference to Jensen (1942), who maintains that species of the pelagic Sudiid fish, *Paralepis*, found in the same regions as the trawled specimens of *Ceratias holbölli*, represent adults which have drifted northwards from lower latitudes until the water becomes so much cooled that the *Paralepis* spp. are paralysed, 'becoming an easy victim to seals and fishes of prey, or they float dying or dead up to the surface of the water, and thereupon may drift ashore'. Jensen's evidence appears to be that post-larval *Paralepis* are found in warmer water than the adults, and that these adults are rarely taken in nets in northern latitudes, but do occur in the stomachs of seals, tunnies, coalfish and cod. The evidence that *Paralepis* drifts ashore dead seems to be confined to a missionary report, a single floating specimen found by Jensen, and one specimen washed ashore at Jutland in 1865. Contrary to Jensen's argument, it may be supposed that the presence of adult *Paralepis* in high latitudes is a natural part of their migrational distribution, and that, possibly assisted by their attenuated shape, they are able to avoid pelagic nets—but not predatory fishes. One may refer here to their southern congener, *Paralepis coatsi*, which is of circumpolar distribution in the Antarctic within the limits of the pack-ice (Norman, 1937). I notice that here also *adults* of this species have not appeared in the catches of oceanographical expeditions, whereas factory ship biologists, in their reports to the Discovery Committee, have repeatedly noticed adult* *Paralepis coatsi* in the stomachs of Blue and Fin whales. Their presence in the stomachs of these whales is undoubtedly fortuitous. Like the whales which happened to engulf them, these fish had been feeding on the shoals of adult and yearling krill (*Euphausia superba*) which, as I am informed by Mr J. S. Marr, for the most part live right at the surface, between 0 and 5 m.

Jensen's survey of the occurrence of *Paralepis* is thus open to a different interpretation which does not support Bertelsen's argument regarding *Ceratias*.

With so few specimens available, one can only speculate on what relation the known distribution of *C. holbölli* does, in fact, bear to the great ocean currents, north and south. Dykgraaf (1934) has shown that pelagic fish tend to drift or swim with the current, and not against it as formerly believed, so there seems no doubt that the sluggish adults of *C. holbölli* are as much borne by the currents as the juveniles are likely to be. If, as has been suggested, this fish in polar regions has a range from the middle depths to within 100 m., or even less, of the surface, then, in the Antarctic, any vertical migration within the upper part of this range would tend to keep it in a high southern latitude. It would move between the shallow Antarctic surface water, 0–200 m. thick moving towards the north, and the Warm Deep Current moving south (Mackintosh, 1937). During the low light intensity of the winter it might spend more time in the surface current, and so move northwards towards the Antarctic Convergence, until forced down in this region by either temperature or light barriers, or both, to continue north with the Antarctic Intermediate Current under the conditions of tropical submergence. With further submergence in a lower latitude this fish (or another generation) might find itself in the Warm Deep Current again and so be returned to the Antarctic (Deacon, 1937, fig. 1). Or it may enter the northern circulation, since Coe (1946) has suggested that there are areas, like the deep water off Bermuda (which has components of Arctic, Antarctic and Mediterranean origins), where bathypelagic animals may collect in eddies or be widely redistributed during the course of generations.

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* Thirty-seven individuals, removed from the stomachs of Blue and Fin whales in the Antarctic season 1947–8, had a mean length (with caudal) of 29·7 cm., $\sigma = \pm 4 \cdot 1$.

Nothing can be said concerning breeding in relation to these hypothetical drifts of *C. holbölli* except that reproduction is likely to take place in fairly deep water at a low latitude. This is suggested by the regressed condition of the ovaries in the Antarctic specimen and by the fact that sixteen of the twenty four known juveniles have been captured at stations within the tropics.

PERCEPTION IN *CERATIAS HOLBÖLLI*

Waterman (1948) has described the Ceratioid *Gigantactis longicirra* as a floating, bathypelagic trap. Even more so *Ceratias holbölli* deserves such a description, for the fishing lure in this animal, by its extreme adjustability, achieves a mechanical specialization and efficiency unequalled among the Ceratioidea. The very modifications of such a fish require that, if it is to survive at all, it must be furnished with adequate sensory apparatus. It needs to apprehend the presence of prey and so entice the latter into its mouth by retraction of the lure; and it must be able to sense the approach of predators. Yet the reduction of the senses of vision and olfaction, noticed by Waterman in *Gigantactis*, is carried even further in *Ceratias holbölli*, where the adult female is functionally blind and the nostrils are represented by vestigial tags. The problem, therefore, arises how the highly modified *C. holbölli*, apparently helpless to escape, and defended only by its prickles, can have been able to evolve as a fish blind when adult. Chun (1896) has indicated that luminous organs would betray their possessor to predators in its vicinity. The Sperm whale, whilst seeking the squid which are its normal prey, was presumably attracted in this way to the escal lamp of the Antarctic specimen. But it is conceivable that an angler fish, being aware of the approach of predators, could evade them by extinguishing the tell-tale light (Waterman, 1939*a*, 1948; Harvey, 1940, p. 161).

The means of this perception in the adult *C. holbölli* is at present obscure. Whilst discussing the attraction of males attention has been drawn to the evidence adduced by Brauer (1908) and Waterman (1948) of a sensory function subserved by the esca in *Gigantactis*. But it was pointed out that in *Ceratias holbölli* there are at most only two of those numerous filaments which characterize the esca of *Gigantactis* and which might be supposed to be sensory in nature. We must probably look elsewhere for the sensory apparatus in *Ceratias holbölli*. Now Waterman (1948) has shown by anatomical studies that the stato-acoustic system of *Gigantactis* is considerably developed. Probably a similar or greater development of this system is attained in *Ceratias holbölli*. Parker (1904) and Dykgraaf (1934) have emphasized a 'lateral line sense' supposed to make fishes aware of low-frequency movements in the water, so it may be that the lateral line organs on the head of *C. holbölli* are sensitive to local disturbances and that these are mediated with especial sensitivity.* By the amplitude of these disturbances the fish may be informed of the vicinity of greater or lesser animals, of predator or prey.

Of course this is supposition, but at least it may serve with whatever else is tentative in the present account to draw attention to the biological problems raised by only one, albeit the most specialized one, among this curious group of bathypelagic angler fishes.

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* Similarly the blind group of amblyopsid Cyprinodonts show on the head and body a special development of papillae, believed to subserve perception (Norman, 1931).

SUMMARY

1. An adult female Ceratiid fish, 43·0 cm. standard length, was removed from the stomach of a Sperm whale shot in the Antarctic Ocean in December 1947.

2. It is identified as the rare bathypelagic angler fish, *Ceratias holbölli* Kröyer, 1844, by detailed comparison of the external features, fishing lure, caruncles and viscera, with Kröyer's account and with a specimen preserved in the Natural History Museum.

3. Adult specimens of this fish have previously only been recorded from the coast banks of northern seas. This adult is the first from oceanic water.

4. An observation on the adjustability of the fishing lure, made when the Antarctic specimen was recovered, confirms Bertelsen's conclusions from anatomical structure (1943). The musculature of the lure in *Ceratias* is compared with that in another Ceratioid genus, *Gigantactis*.

5. The viscera of *Ceratias* and *Gigantactis* are compared. In general they are similar, but *Ceratias* possesses two pyloric caeca; these are altogether lacking in *Gigantactis*. Neither genus possesses a swim-bladder.

6. The ovaries of the Antarctic specimen were regressed and contained very young eggs, suggesting a much restricted breeding season which may have been a major stimulus in the evolution of attached males for these solitary, sluggish fishes.

7. A study of allometric growth in *Ceratias holbölli* provides further evidence for Bertelsen's claim that the species of *Mancalias* are juveniles of *Ceratias*. The dimensions of thirteen specimens, representing 'species' of *Mancalias* and *Ceratias* are found to conform to the simple allometry equation $y=bx^{\alpha}$. The allometry of the various parts is described and its significance discussed.

8. In particular, the growth of eyes and nostrils is strongly negatively allometric. During ontogeny the tubular mostrils of the young fish suffer reduction to vestigial tags in the adult; and the conjunctiva of the eye is borne across the eyeball, which becomes subcutaneous, so that the adult is functionally blind.

9. In the young fish the caruncles are the only organs which clearly show positive allometry, but at about 12 cm. standard length caruncle growth becomes enantiometric and thereafter the caruncles dwindle in absolute size. The onset of this enantiometry is believed to betray a crisis in development, which is probably sexual maturity. The caruncles may be recognition marks for the males.

10. The systematics of *Ceratias* are discussed and revised, principally on the evidence of allometric growth. Bertelsen's southern species *C. tentaculatus* is considered invalid and the genus reduced to the single species *C. holbölli* Kröyer, 1844.

11. Parenthetically, it is emphasized that routine examination of Sperm whale stomachs could increase our scanty knowledge of the nektonic macrofauna. Some bathypelagic squids and fishes may be more common and grow larger than is at present supposed.

12. *C. holbölli* is of world-wide distribution, extending from equatorial to polar seas. Its known bathymetric distribution ranges from 1000 to 120 m. from the surface. This upper limit is only attained in high latitudes where the fish extends into the mesopelagic zone.

13. Tropical submergence can account for these aspects of horizontal and vertical distribution. Light intensity is considered to be more important than temperature as a factor limiting the ventrical range of *C. holbölli* at any one latitude.

14. Evidence is offered against the theory that *C. holbölli* and certain other fishes (notably *Paralepis* spp.), taken off the Greenland and Iceland coasts, have been forced towards the surface by the cold polar current. A tentative hypothesis is advanced regarding the distribution of *C. holbölli* in relation to the ocean currents, especially of the southern hemisphere.

15. The problem of sensory perception in the adult *C. holbölli* is discussed. The fish is functionally blind, and olfaction is considerably reduced. It is suggested that the lateral line organs are more likely than the esca to undertake this function of informing the fish of its environment.

POSTSCRIPT ON A RECORD FROM THE AZORES

Since the above account was written I am able to record, again from a Sperm whale's stomach, but this time from the Azores, a further adult specimen of *Ceratias holbölli*.

During my investigations on Azores whaling, conducted in the summer of 1949, the stomach contents of a certain Sperm whale (no. F21, ♂, 16·0 m. long) were found to include a remnant of fish skin, about 600 sq.cm. in area, greyish black in colour and closely beset with spines. Any associated remains were too much digested and were not recovered.* The shape of the spines, and their arrangement in the skin, betrayed the latter as unmistakably belonging to a specimen of *C. holbölli*. The largest spines were 0·6 cm. high and 0·9 cm. across their shield-shaped bases. These measurements agree with those of Regan's specimen (p. 24) and suggest that the Azores individual was about the same size, i.e. around 100 cm. total length.

The whale was killed on 11 August 1949. I witnessed the harpooning and lancing, and noticed that a giant squid, vomited in the death-flurry, was quite fresh. The whale had therefore recently been feeding, and so it is likely that the angler fish had been swallowed within, say, a 5-mile radius of the position where the whale had been harpooned. The whaleboat was then about 20 miles south-west of Capelinhas Lighthouse, Fayal; this gives a position approximately 38° 21′ N, 29° 08′ W, and the chart shows soundings of between 1300 and 1700 m. within a 5-mile radius of this point. The record has been inserted in Fig. 6 and marked X, but it does not appear in Table 3.

The total number of recorded adults of *C. holbölli* (Table 3) now stands at fifteen; but only two of these, the Antarctic and Azores specimen, have been secured from oceanic water. Yet it is worth remarking that out of 106 Sperm whale stomachs I have examined to date, two contained *C. holbölli* among the ten stomachs which held fish remains of some kind or another. This not only seems a high incidence for what has previously been supposed to be a very rare fish (p. 3), but it also tends to support the view that the thirteen specimens from the coastal fishing banks happen to have strayed horizontally from their proper habitat in oceanic water (pp. 25, 27).

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* For this record I am entirely indebted to Senhôr José dos Reis, manager of the whaling station at Horta, Fayal. When the whale concerned was worked up I was still absent with the whaleboats, and Senhôr dos Reis kindly examined the stomach for me. He retrieved this dingy piece of skin and, with admirable forethought, kept it three days against my return.

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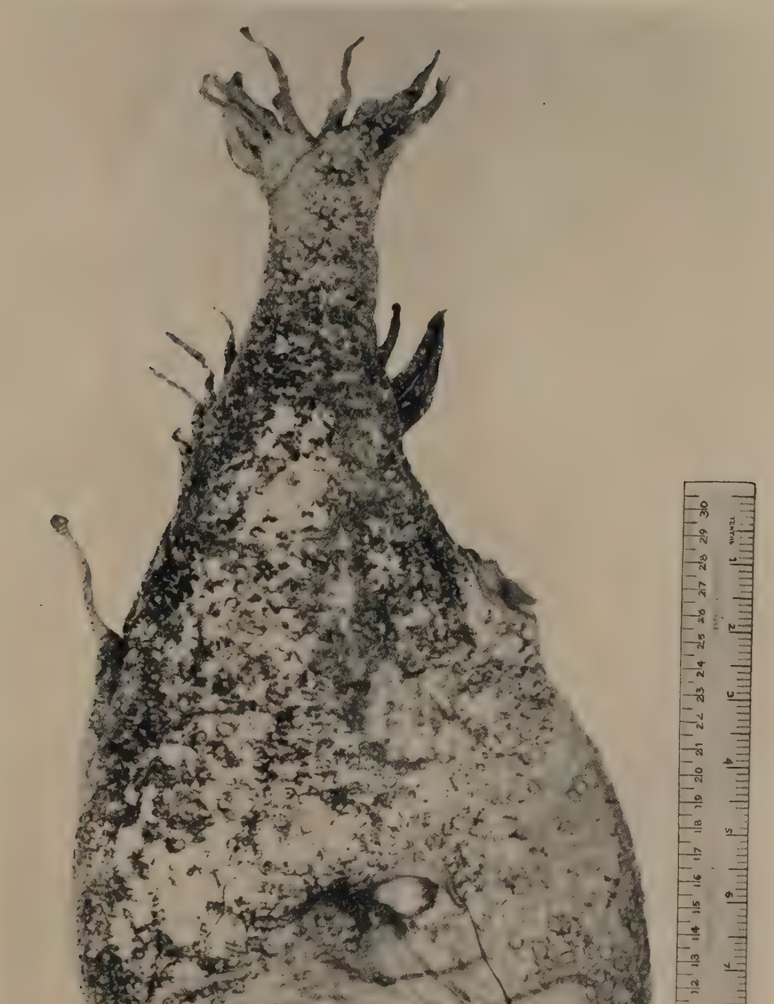
PLATE I

Ceratius holbölli Kröyer. The Antarctic specimen from a Sperm Whale's stomach.



[*Discovery Reports. Vol. XXVI, pp.* 33–46, *Plates II–IV, January* 1951.]

STYLASTERIDAE (HYDROCORALS) FROM SOUTHERN SEAS

By

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(Plates II–IV, Text-figs. 1–12)

SPECIMENS of Stylasterids (Hydrocorals) have been taken by the ships of the Discovery Investigations at only a few stations. The Stylasteridae are on the whole comparatively scantily represented in collections of deep-sea expeditions, because in localities favourable to their growth the nature of the bottom makes collecting difficult.

Nevertheless, the Discovery material is very interesting both from a taxonomic point of view, containing as it does a peculiar new genus and two hitherto undescribed species, and also from the zoogeographical data supplied by the localities. From two of the stations so much material was collected that some impression of variation in the species *Errina antarctica* (Gray) can be obtained. This species is evidently widely distributed in antarctic-subantarctic waters.

Errina (Eu-Errina) antarctica (Gray, 1872)

(Pl. II, fig. 1; Pl. IV, figs. 3–6)

Porella antarctica Gray, *Proc. Zool. Soc. Lond.* 1872, p. 746, pl. 64, fig. 4.

Labiopora antarctica Moseley, *Philos. Trans.* 1878, vol. 169, pp. 476, 480. Ridley, *Proc. Zool. Soc. Lond.* 1881, p. 105.

Errina gracilis von Marenzeller, *Rés. Voy. Belgica, Rapp. Sci., Zool. Anvers*, 1903, p. 4, pl. i, figs. 1–4.

Errina antarctica Hickson, *Proc. Zool. Soc. Lond.* 1912, p. 887. Hickson, *Bull. Mus. Hist. Nat. Paris*, 1912, p. 2 (462). Broch, *Skr. d. Norske Vid.-Akad. Oslo*, I. Mat.-Naturv. Kl. 1942, no. 3, p. 42, figs. 11, 12, pl. iv, fig. 12.

St. 652. Burdwood Bank, 54° 04′ S, 61° 40′ W, 169–171 m. Net badly torn (hard bottom).
St. 1948. 60° 49·4′ S, 52° 40′ W, 490–610 m.
St. 2200. Between Young and Sturge Is., Balleny Group, 67° 09·6′ S, 163° 27·7′ E, 532–512 m.
St. 2215. Off Antipodes Is., 49° 45·6′ S, 178° 48′ E, 163–210 m.
St. 2290. Off Falkland Is., 52° 16·6′ S, 58° 06·8′ W, 137–133 m.

The *colonies* of *Errina antarctica* are in most cases rather coarse and heavily built, fan-shaped with a distinct anterior and posterior side, the latter with none or only very few pores. The distal branchlets have numerous pores and spines on all sides (see Pl. II, fig. 1), but the spines tend to diminish and disappear on the posterior side, which may be naked and all but poreless already some 1 cm. from the top. The terminal branchlets carry spines on all sides and are cylindrical. They are differentiated into a zooid-bearing anterior and a naked posterior side, with more or less pronounced flattening of the branch, which in transverse section becomes more obviously oval, its greater diameter lying in the plane of the fan. In the basal parts of larger colonies spines and zooids disappear also on the anterior face of the main branches and stem. In many cases basal parts of the stem and main branches, where pores have disappeared, grow so broad that they coalesce into one flat basal stem or trunk.

It must be noted that the colonies may be partly incrusting. Whether a colony can spread over a large area cannot be answered with certainty, but part of a colony from the Burdwood Bank apparently has a horny black axis, because the hydrocoral has grown around the axis of a dead gorgonid and from this part real branches arise (Pl. II, fig. 1).

The material from Sts. 2200 and 2290 is especially rich, indicating the range of variation in the species.

The colony from the Burdwood Bank is on the whole very coarsely constructed like the colonies from St. 2200 (Pl. IV, figs. 3, 4 and 6). Colonies which are comparatively heavily built are almost always rather regularly flabellate, sometimes also a little incurved on the anterior side. On the other hand, colonies of more delicate construction and with marked ramification in many cases exhibit a more irregular growth and tend to have a more bushy appearance, although a main plane can still be distinguished (also from St. 2200, Pl. IV, fig. 5). An excellent figure of this type has been given by von Marenzeller (1903, pl. i, fig. 1) in his description of *E. gracilis*.

The branching is dichotomous or subdichotomous. However rich the branching may be, anastomoses are very seldom found.

The *colour* of the colony (in spirit) varies from a vivid brilliant carmine or brick red to almost white or yellowish, or occasionally light brown. Dead colonies may be greyish white, but very soon they attain a dark dull brown colour, probably owing to the attack of foreign micro-organisms. (Dead colonies are of course also exposed to attacks of boring animals. In living colonies, sections have revealed the occurrence of small, parasitic crustaceans lodged in 'ampullae', evidently caused by the parasites, but not visible to external examination. The identity of the crustaceans has not been established.)

The surface of the coenosteum after cleaning with sodium hypochlorite generally exhibits the peculiarly reticulated structure reminiscent of a lump of sugar; but in some colonies the structure is more vermiculated and feebly glossy. The differences are so small and gradual that they cannot be regarded as of taxonomic importance.

In a previous paper (1942) I distinguished provisionally a form *kerguelensis* from the typical form from Cape Horn. The scanty material suggested small differences in the surface structure of the coenosteum which, however, fell well within the range of variation. Another small difference was observed in the *gastrostyles*, which in the Cape Horn specimen were more slender and spine-like. This, however, must be looked on as an anomaly. Several gastrostyles from different colonies have been examined, and in the main they coincide with the fir-cone-like gastrostyles of the Kerguelen colony (1942, fig. 12), which are characteristic of *E. antarctica*. On the other hand, *E. spongiosa* Broch, 1942 may exceptionally show some external likeness to the coarsest colonies of *antarctica*.

Among the features separating these two suggested forms of *E. antarctica* the *ampullae* were also mentioned. In the Cape Horn specimen they protrude 'almost hemispherically on the surface', whereas in the Kerguelen fragment they 'are not visible on the surface of the branchlet', although belonging to the superficial layers of the coenosteum. Both fragments were from dried specimens, and it was not possible to ascertain the sex; however, I hinted that possibly the Cape Horn specimen might be a female.

In the present abundant material, several colonies occur in which ampullae cannot be seen externally, whereas in others they are very obvious, protruding like sections of a ball, and, moreover, in vividly red-coloured specimens they are emphasized by a yellow or whitish colour. Fractures reveal, however, that ampullae are present in great numbers in the peripheral layers of the coenosteum of the first-mentioned colonies. An investigation of the contents reveals that these colonies are males, whereas those with protruding ampullae are females.

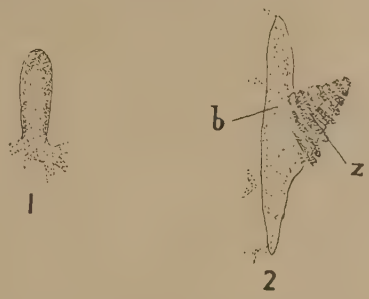
All earlier descriptions have been based on dried specimens, and I took the opportunity to examine the soft parts in the rich material to hand.

The *gastropolyps* have from three to six (mostly four) small, thread-shaped tentacles, which exhibit pronounced extension and contraction.

In *antarctica* as well as in some other *Errina* species the dactylopores are of two types, viz. the niche- or slit-like dactylopores (grooves) of the grooved spines, and the small circular pores of the coenosteum between the spines. In the terminal branches all intermediate stages occur (see Broch, 1942, p. 44), and von Marenzeller (1903) was accordingly inclined to consider the small pores only as developmental stages of the larger pores of the spines. It is impossible from examination of dried specimens alone to solve this question or to determine whether a real dimorphism exists. But investigation of the soft parts shows that the dactylozooids also exhibit a dimorphic development correlated with the type of pore. The dactylozooids inhabiting the simple pores of the coenosteum are digitiform (Fig. 1) and lack a specially developed basal adhesive part attached to the bottom or wall of the pore. The dactylozooids of the 'large pores', or grooves of the spines on the other hand, have a long basal segment attached to the wall of the lower part of the groove and the outer part of the adjoining pore, the digitiform, free part of the dactylozooid arising from the middle of the basal segment (Fig. 2). In the Discovery specimens the contracted free part is shorter than the basal segment, and it is impossible to judge of its length when extended. We must, however, presume that its powers of extension are rather large.

Thus it appears that a real dimorphism exists among the dactylozooids of *E. antarctica* correlated with the dimorphic development of the dactylopores.

The *male* ampullae contain a few gonophores (generally three) in different stages of development. When one gonophore is quite ripe and about to discharge its contents, the smallest (third) gonophore is only a rudimentary bud. No blastostyle can be detected in the ampulla. In this respect *E. antarctica* obviously differs from *E. spongiosa* Broch, 1942. The spadix of the male gonophore varies somewhat in shape, but always seems to be branched. In some cases it forms a very primitive 'trophodisc', whereas in other cases it is bi- or trifurcate, with the branchlets embedded in the contents of the gonophore.



Figs. 1, 2. Errina antarctica from St. 652. (1) Simple, digitiform dactylozooid from pore between the spines. (2) Dactylozooid from the groove of a spine; the digitiform, free part of the zooid (*z*) arises from the middle of a large, adhesive basal part (*b*). × 80.

The *female* ampulla only contains one gonophore. In those ampullae which were either empty or contained planula larvae about to escape, no secondary gonophores were seen. This may of course be a chance observation. The ripe ovum rests on a slightly hollowed bowl-shaped trophodisc, which in structure is intermediate between the trophodiscs of *Stylaster roseus* and *S. gemmascens* (Broch, 1942).

It is evident from the general characteristics of the colonies and the coenosteum that *Errina gracilis* (von Marenzeller, 1903) is a synonym of *E. antarctica*, and there is no reason to distinguish a form *kerguelensis* (Broch, 1942) as distinct from the typical form of the species.

Errinopsis reticulum n.gen., n.sp.

(Pl. II, fig. 2; Pl. III, figs. 1, 2)

St. WS 246. South of Falkland Is., 52° 25′ S, 61° 00′ W, 208–267 m. Coarse green sand and pebbles.

The Discovery material consists of four colonies, luxuriant but not quite intact, and several fragments (probably broken away from the peripheral parts of the colonies). The largest colony, a splendid specimen with the greater transverse diameter measuring 32 cm. and a height of 25 cm. (the basal part with the attachment to a support has been broken away) is dried, consequently the two colonies next in size, one male and one female, which have been preserved in alcohol, have been selected as type specimens. They are reproduced in Pl. II, fig. 2, and Pl. III, fig. 1.

As indicated by the specific name *reticulum*, the colonies throughout have the appearance of a simple or complex fan, built up of a coarse network or filigree of anastomosing branches. Along the periphery of the colony, where branchlets bud, the terminal parts of the branchlets very soon touch and also coalesce to form new meshes. Terminal branchlets may have a diameter of only about 1 mm., but they soon grow thicker, and the diameter of the branches generally increases to 3–4 mm., in some cases even to about 5 mm. The meshes commonly have diameters of some 3–8 mm., and the size of the meshes is fairly constant in older parts of the colony. During growth the branches become oval in transverse section, the greater diameter being perpendicular to the main plane of the flabellum. In older parts of large colonies the greater diameter may often exceed twice the shorter diameter in length.

Accessory fans are common in older colonies. Such secondary fans diverge more or less strongly from the plane of the mother fan and are attached to the latter along the greater part of one side. In some cases a secondary fan may attach itself by its entire periphery to the mother fan, so that a closed 'basket' is formed, generally with finer meshes than in other parts of the old colony. The photographs on Pl. II, fig. 2 and Pl. III, fig. 1, convey the general features more clearly than any description.

The largest dried colony has a continuous accessory fan formation along the entire lateral and upper peripheral part, and the colony appears about to split along a line some 3–7 cm. within the margin into two somewhat diverging fans.

Under the microscope the surface of the colony gives a general impression of being finely reticulated. However, when cleaned with sodium hypochlorite the coenosteum becomes rather glossy, and its surface then exhibits a more vermiculated structure strongly reminiscent of a fingerprint (Pl. III, fig. 2). In places this vermiculated structure, owing to greater irregularities in the lines, presents a more reticulated appearance, but in all cases the surface keeps its semi-glossy character and does not give the 'lump of sugar' impression of the *Eu-Errina* species described by Broch in 1942.

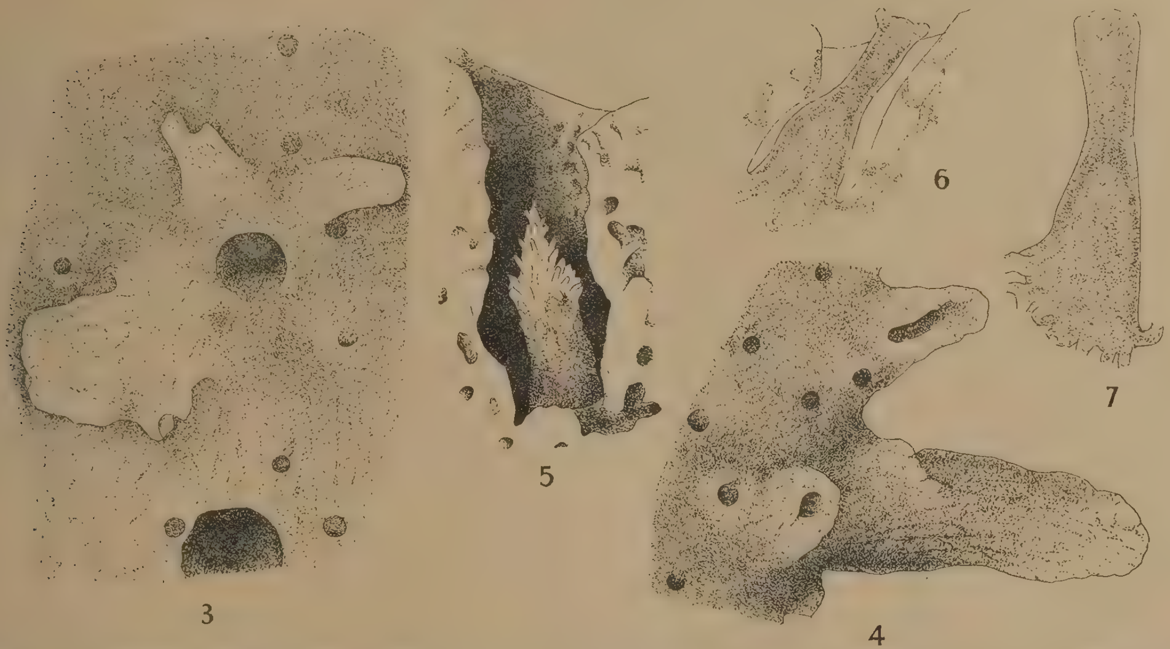
The internal structure of the coenosteum is almost homogeneous, approaching to a certain degree the compact porcellaneous consistency of the *labiata* group of *Errina*. On the other hand, the central part with somewhat thicker branches is lighter in colour than the peripheral layers, and in some cases the axial part is all but white. In accordance with the comparatively porcellaneous appearance, the coenosteum is rather hard, and grinding is not so easy as in most of the *Eu-Errina* species. It must be added that there are no coarser canals in the oldest and thickest branches.

No correlation between the position of gastropores and dactylopores can be traced. The *gastropores* are rather small, their diameter at the opening measuring only 0·3–0·4 mm. The pores are also not particularly deep, and the well-developed gastrostyle is easily observed externally in colonies cleaned with sodium hypochlorite (Fig. 3). The gastrostyle (Fig. 5) resembles a pine cone with rather bristling scales, although it is comparatively compactly constructed. The cone is placed on top of a fairly high pedicle with smooth walls. Occasionally a gastrostyle was observed having an almost needle-shaped prolongation of the apical part of the cone.

It is impossible to discern any regularity in the distribution of the gastropores in peripheral free branchlets. In older branches, on the other hand, the great majority of gastropores are found along the lateral sides facing the meshes, whereas the anterior and the posterior sides of the branches (the flabellum) have only a few gastropores. The numbers are also smaller on the posterior than on the anterior side of the colony.

It has already been mentioned that no regular correlation between gastropores and *dactylopores* can be traced. Nevertheless, from one to three or four spines are almost always formed at the opening of the gastropore, each spine with one or more dactylopores (Fig. 3). In some cases such spines are wanting, and in others dactylopores occur in great numbers between the spines and independent of them. On the peripheral branchlets spines are numerous and equally developed on all sides. When the branchlets grow thicker, the spines seem to diminish, or to disappear little by little, first on the posterior and subsequently on the anterior side of the colony. Along the sides of the meshes, however, spines are present also in older parts of the colonies, although they are more prominent on the thinner, apical or peripheral, branchlets than on more central branches of the meshwork (Pl. II, fig. 2; Pl. III, fig. 1). These features seem to indicate that the spines are gradually absorbed by the growth of the surrounding coenosteum, and that they do not grow materially after the incorporation of the branchlet in the meshwork of the colony.

At first glance we might presume dimorphism to exist among the dactylopores, small dactylopores being found as circular holes in the coenosteum in great numbers between the spines (Figs. 3, 4). On the other hand, it is obvious that the spines do not quite correspond either to the nariform or the waterspout-like spines of *Errina*. In their disposition, especially on the branchlets, they are reminiscent of the nariform spines of *Eu-Errina*, but it is also evident that they are connected with, or probably developed from, spineless pores by growth of the surrounding coenosteum (Fig. 4). The growth is not symmetrical, but at first results in a spine with an obliquely placed, oval pore-opening. In many cases the apical part of the spine grows far above the pore, so that this becomes an oval opening or slit on the side of a conical spine. In other cases the pore continues as a groove or narrow conduit to the very top of the spine. Again, two or three pores may debouch on one spine, and here one may be round, the other more groove-like. In Fig. 3 the lumpy spine is furnished with two grooves, both of which run conduit-like to the very summit of the 'spine'.



Figs. 3–7. **Errinopsis reticulum** from St. WS 246. (3) Part of the surface of a branch; near the brim of the central gastropore three 'spines' are seated, the lumpy one with two grooves or conduits from base to summit. (4) Lateral part of a branchlet with full-grown and developing spines. (5) Gastropore from the fracture of a branch showing the entire gastrostyle in side view. (6) Gastropolyp *in situ* drawn on basis of two slides. (7) Gastropolyp prepared out. (1), (2) and (3) after skeleton having been cleaned with sodium hypochlorite; (4) and (5) from decalcified fragments. (1) ×40; (2)–(5) ×60.

A careful examination of the coenosteum alone does not furnish a safe basis for determining whether the dactylopores exhibit real dimorphism. This question can only be settled by examination of the soft parts of the colony.

The *dactylozooids* are throughout simply finger-shaped without any specially developed basal adhesive part; they agree entirely with the smaller dactylozooids of *E. antarctica* (Fig. 1). The uniformity of the dactylozooids and the many intermediate forms bridging the differences between simple and spiniferous pores furnish evidence that dimorphism does not exist.

The small *gastropolyps* (Figs. 6, 7) are tubular and have four to six rudimentary small tentacles which are exceedingly difficult to trace in contracted specimens.

Both male and female colonies are found in the Discovery material. The male colony (Pl. II, fig. 2) is much lighter coloured than the female (Pl. III, fig. 1). This, however, may be fortuitous. On the other hand, although the male ampullae are placed rather superficially on the branches, there is no external indication of their presence, whereas the female ampullae are generally marked by lighter coloured or whitish spots on the branch or, in many cases, also by feeble swellings. Nevertheless, the ampullae do not show as protuberances among the pores or spines.

The *male* ampulla contains two to four gonophores, one of which may be fully ripe, whereas the second is less advanced in its development, the other gonophores being very small or quite rudimentary. In half-ripe gonophores, where the spadix attains its greatest development, the spadix is saucer-shaped with a small varying number of pouches or lobes, i.e. it is a simplified 'trophodisc'. The gonophores bud from the basal part of a finger-shaped blastostyle similar to that observed in *Distichopora violacea* (England, 1926) or *Errina spongiosa* (Broch, 1942), the agreement with the latter being especially marked.

While the male ampulla does not generally exceed 0·5 mm. in diameter, the ripe *female* ampulla has a diameter of about 1 mm. or even a little more. As a rule only one ovum develops at a time in the ampulla. No detailed study of the development of the gonophores was made, but they do not appear to differ from the common types of gonophores among Stylasteridae (Broch, 1942).

The present species cannot be assigned to any previously described form among the Stylasteridae. The irregular distribution of gastropores and dactylopores proves that it belongs to the subfamily Sporadoporinae, and the spines connected with several of the dactylopores, together with the arrangement of these spines in terminal parts of the branches, suggest the genus *Errina*. However, a thorough examination of the spines reveals that they differ from the regular spine types of *Errina*, from both the nariform spines of *Eu-Errina*, and from the 'waterspouts' of *Labiata* (Broch, 1942).

Above all, the colony is rather aberrant in its mode of growth. In some species of *Errina* various authors have emphasized the occurrence of more or less incidental anastomoses between adjacent branches of the colonies and used this as a specific characteristic. In the present species it is difficult to detect a free branchlet even at the periphery of the net-like colony, and the growth form of the new species seems to occupy a position among the Stylasteridae similar to that of the *Retepora* colonies among the Bryozoans. It is accordingly reasonable to regard this mode of growth and branching as a generic character, a point of view which to a certain degree is strengthened by the features of the spines and their above-mentioned independence of special dactylopores and dactylozooids. It is probable that the latter character should be more properly regarded as a specific feature. To settle this question, however, comparison with other related species is needed.

Hence the specimens can be regarded as the representative—and type—of a new genus,

Errinopsis n.g.,

the characteristics of which at present coincide with the genotype:

Errinopsis reticulum n.sp.

Colony simple or composite flabelliform, the branches anastomosing to form a regular, fine meshwork. Gastropores and dactylopores irregularly scattered on all sides of the terminal branchlets; in older parts of the branches the numbers of pores, and especially of dactylopores, diminish. Spines are numerous on all sides of the terminal branches, but disappear gradually on the posterior and anterior sides of the branches towards the central parts of the flabellum, although they are present along the sides of the meshes in older parts of the colony. Surface of the coenosteum vermiculated, without nematophores. Gastrostyle pine-cone shaped with bristling spines. Dactylostyles wanting. Dactylozooids monomorphic, gastropolyps with four to six rudimentary tentacles.

Conopora pauciseptata n.sp.

(Pl. IV, figs. 1, 2)

St. 2493. 42° 03·9′ S, 00° 03·5′ E, 472 m.

Only a single fragment of a colony (Pl. IV, figs. 1, 2) was found in the catch. The main stem is 23 mm. high with a basal greater diameter of 6 mm. Only the basal parts of broken side branches have remained; their arrangement and construction show that the ramification has been in one main plane, and the stem and branches of the fan exhibit a distinct anterior side with numerous cyclosystems in one main row, whereas the posterior side is devoid of cyclosystems. On the other hand, the stem and branches also have lateral rows of cyclosystems along both sides towards the anterior side.

The surface of the coenosteum exhibits a peculiar vermiculated or striated structure, which is conspicuous before cleaning with sodium hypochlorite, and which is reminiscent of a finger-print, the same structure observed in *Errinopsis reticulum* (see Pl. III, fig. 2), but even more conspicuous in the present species. The finer lines are caused by rows of microscopic pores in the coenosteum through which the surface epithelium communicates with the tissues of the intersecting canals of the stem and branches.

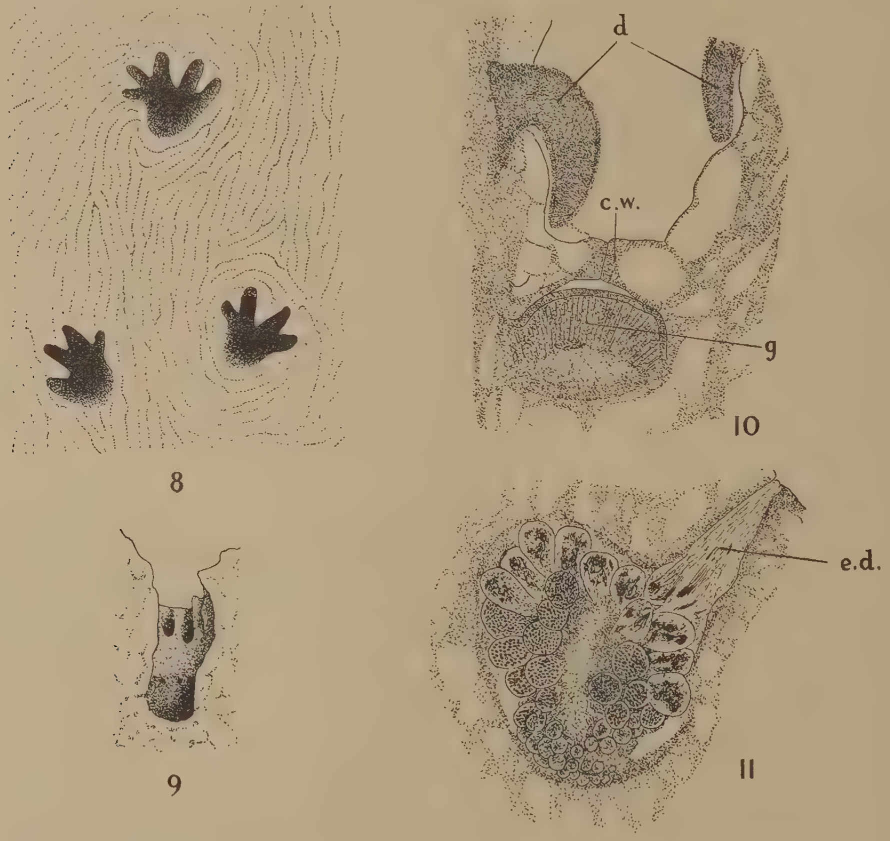
The coenosteum is not so hard as in most *Stylaster* species, but is softer and more easily ground, and although it is not so porous as in the species of *Conopora* previously investigated it compares well with their somewhat more compact construction. The fragment shows no indications of symbiotic worms, but this may be fortuitous. The dimensions indicate that the fragment comes from an old and rather large colony, and one might at all events have expected to find traces of the said symbiosis. This is the second *Conopora* colony observed without symbiotic worms, and it is of interest to note that the ramification and general flabellate shape of the two colonies agree (Broch, 1942, p. 88, pl. xiii, fig. 37*a*), although they evidently represent different species.

The *cyclosystems* of the median, anterior row of the stem and branches have on the whole many fewer dactylopores than the lateral systems. The accompanying table gives a variation from 3 to 6 (average 4·5) in the anterior row, whereas the lateral rows show a variation from 5 to 11 dactylopores (average 8·1).

Numbers of dactylopores ...	3	4	5	6	7	8	9	10	11	Total
Anterior row	2	4	4	2	—	—	—	—	—	12
Lateral rows	—	—	1	2	6	11	6	2	2	30

Complete cyclosystems occur apically on the branchlets; otherwise a single, complete system may quite exceptionally be found on the lateral rows. Generally, however, a diastemma is developed at the upper (adcauline) side (Fig. 8). It is not possible to state with certainty whether this diastemma exists from the beginning. But its mode of distribution in the different cyclosystems indicates that a diastemma is caused by and developed during growth of the coenosteum (the colony), and that the growth of the coenosteum gradually obliterates the adcauline dactylopores, whereas the abcauline side of the cyclosystem remains unaltered. In this way the number of dactylopores will also diminish, a fact consistent with conditions in the Discovery colony fragment.

These characteristics obviously differ from those species of *Conopora* previously described. In the latter the cyclosystems are complete and regular, although one (or two) of the adcauline 'teeth' between the dactylopores in *C. major* (Hickson & England, 1905) tend to develop more strongly than the others, thereby linking the genus *Conopora* to *Crypthelia* (Broch, 1936, 1947). This, however, is fundamentally different from the present case, where some of the adcauline dactylopores evidently disappear, whereas no indication of a 'tongue' can be traced, which might be parallelized with the tooth of *Conopora major* or the lid of *Crypthelia*.



Figs. 8–11. **Conopora pauciseptata** from St. 2493. (8) Part of the anterior side of the stem with two cyclosystems of the median row and one 'displaced' (lower left) at the basis of a branch. (9) Gastropore in side view from a ground section; dactylotomes and lower openings of the dactylopores visible. (10) Median section through the cyclosystem of a decalcified specimen. *d*, dactylozooids; *c.w.* wall epithelium of the chamber wall closing over the gastropolyp, *g*. (11) Section through a male ampulla with its efferent duct, *e.d.* (8) and (9) ×20; (10) and (11) ×60.

A comparison of the cyclosystems of the Discovery fragment with those of the previously known *Conopora* species furthermore reveals that the numbers of dactylopores are remarkably reduced. In *C. tenuis*, Moseley (1878; Broch, 1936, p. 87) found in 128 cyclosystems an average of 15·45 dactylopores (variation from 12 to 19), and in *C. major* in 72 systems 13·22 dactylopores (variation from 9 to 16). In the Discovery species the table (p. 41) shows a total variation in the present fragment (42 systems counted) from 3 to 11, with an average of 7·07 only. The fragment thus occupies an extreme position as to numbers of dactylopores in the cyclosystems.

The diameters of the cyclosystems generally measure some 0·6–0·8 mm. In terminal branchlets the cyclosystems are evidently larger, and their diameter may here (in complete systems) attain a length of about 1·1 mm.

The *gastropore* is fairly deep and so arched that the lower part of its longitudinal axis is almost parallel to the axis of the stem or branch. The upper part of the pore is feebly narrower than the lower. The lower apertures of the dactylopores are found as minute round pores just beneath the feeble ledge limiting the 'basal chamber' from the narrower, funnel-shaped distal part of the gastropore. No sphincter is developed between the two compartments.

The *dactylopores* have large distal and small basal apertures. A great dactylotome, about half as long as the wall of the outer compartment of the gastropore, connects the dactylopore distally with the gastropore (see Fig. 9).

Ampullae are not visible externally on the fragment.

A small piece of the specimen was sacrificed for examination of the soft parts.

The surface of the colony is equipped with numerous small nematophores which appear as round spots. Under the microscope a mass of large stinging capsules is seen, larger and obviously different from the small capsules of the dactylozooids. Fixation of the material, however, is not good enough to allow of closer examination of the types of capsule.

The polyps are of course contracted (Fig. 10). The *gastrozooids* are globular with no trace of tentacles. The epithelium of the wall of the lower gastropore chamber can close sack-like over the contracted zooid (Fig. 10, *c.w.*), and at the same time the large, finger-shaped *dactylozooids* are doubled down, their tips in many cases reaching to the closed sack. The adnate basal part of the dactylozooid is comparatively small, being only a little broader than the basal breadth of the zooid.

The fragment is from a *male* colony. The ampullae are completely embedded although placed near the surface of the stem and branches. They are furnished with a well-developed efferent duct (Fig. 11, *e.d.*), which in most cases opens into the outer part of the cyclosystem funnel, a little outside (above) the dactylozooids. The ducts may open anywhere on the surface of the colony.

Owing to the scanty material only one series of rather thick sections in celloidin was examined. Details of the gonophores can therefore not be given. The ampulla contains one large 'blastostyle' carrying a great number of small gonophores (Fig. 11); the apical gonophores, placed next to the efferent duct of the ampulla, have ripe spermia, whereas the basal ones are as yet only quite rudimentary buds. The production of gonophores evidently continues for some time, spent gonophores being successively replaced from the basal part.

The present specimen diverges strongly from *C. tenuis* and *C. major*, but is definitely more closely related to *C. dura* (Hickson & England, 1908). However, the description and drawings of the last-named species reveal differences, which do not indicate specific identity. Both species have numerous small nematophores on the surface of the colony; but in *C. dura* the authors say that the nematophores have 'slightly raised lips', and such lips are wanting in the Discovery fragment. The surface of *C. dura* is characterized as 'smooth' (in the drawing it seems punctuated), whereas the Discovery specimen has an obviously and peculiarly vermiculated surface.

In the cyclosystems we find that those in *C. dura* are 'irregularly distributed on all sides of the branches and main stem', whereas the present colony has a naked posterior side and the cyclosystems arranged in rather distinct rows laterally and anteriorly. Although the shape of the cyclosystems in *C. dura* is characterized as 'irregular', the drawings show that they are complete without any diastemma in the dactylozooid circle. The drawings also indicate that the mouth of the cyclosystem in *C. dura* projects a little over the surface of the coenosteum. These are differences which distinguish *dura* from the Discovery specimen, which also has no horizontal septum between the upper and lower chambers of the gastropore, the limit being only feebly emphasized by a rudimentary ledge, on the lower side of which a row of small pores occurs, through which the gastropore and the lower part of the dactylopores communicate.

Although at present the full range of variation in the species of the genus *Conopora* is not known, it seems most probable that the specimen from the Discovery material represents a hitherto undescribed species, the features of which may be summed up as follows:

Conopora pauciseptata n.sp.

Colony flabellate (?). Stem and main branches with cyclosystems in three main rows along the anterior and lateral sides. Surface vermiculated, with numerous small nematophores. Cyclosystems complete only terminally on branchlets, elsewhere embedded and incomplete, with an adcauline diastemma in the dactylopore circle. Gastropore with a feebly broader lower chamber separated from the funnel-shaped narrower upper chamber by a circlet of small pores, through which the dactylopores communicate with the gastropore. Dactylotomes about half as long as the wall of the upper gastropore chamber. Dactylopores in the (incomplete) cyclosystems of stem and branches number 3 to 11 (average about 7·07).

ZOOGEOGRAPHICAL REMARKS

Up to the present species of the genus *Errina* have only been reported from antarctic and sub-antarctic (antiboreal) waters. The Discovery Expedition has added one species of a closely related genus, *Errinopsis*. It is of interest at this point to review the antarctic and sub-antarctic data as a whole and in connexion with the comparatively rich Discovery collections, and to compare them with data from other regions.

According to our recent knowledge (Broch, 1942) the genus *Errina* must be regarded zoogeographically as a southern genus, the overwhelming majority of specimens deriving from sub-antarctic waters, and it seems reasonable to assume that the genus must have originated in this region.

It is very difficult to determine the species of this genus. Their distinguishing characteristics are in many cases seemingly of minor importance, and Hickson (1912), moreover, observed great variation in his comparatively abundant collections of the species *E. novae-zealandiae*, which he accordingly split into several 'facies'. However, like previous investigators of Stylasteridae, Hickson did not take into account those subtle characters which have proved to be of the greatest importance as a specific *fundamentum divisionis* in several cases, and his 'facies' seem to be more in the nature of casual growth forms of colonies, probably caused by ecological conditions.

It is accordingly of interest to note that the 'small' characteristics of the species *E. antarctica* are obviously stable. Colonies, the surfaces of which have in places been more strongly eroded, may at first give an aberrant impression. However, branch ends intact with undisturbed surface and intact spines exhibit all the typical characters and do away with every doubt as to specific identity.

E. antarctica is characteristic of the antarctic and sub-antarctic regions (Fig. 12). According to Ridley (1881) the northernmost find and the type locality was made by the *Alert* expedition in the Trinidad Channel (Madre-de-Dios archipelago in south-west Chili, about 50° S) at only 45 fathoms depth, still the shallowest locality recorded.

The species is remarkably eurybathic. According to present data it is found at depths of some 500 m. (the two deepest Discovery hauls of *E. antarctica* were from St. 1948, 490–610 m., and St. 2200, 532–512 m.). The *Belgica* expedition brought home some specimens of a Stylasterid recorded by von Marenzeller (1903) as *E. gracilis*, which, as stated above, must be regarded as a synonym of *E. antarctica*. Von Marenzeller did not give the exact depths of the four localities south-east of Peter I Island, whereas Hickson (1912) says that the depth 'is probably between 500 and 600 metres'. I am indebted to the director of Institut Royal des Sciences Naturelles de Belgique, Dr V. van Straelen, for the exact data concerning these localities:

12. v. 1898, 71° 14′ S, 89° 14′ W, depth 450 m.
18. v. 1898, 71° 18′ S, 88° 02′ W, depth 450 m.
27. v. 1898, 71° 15′ S, 87° 39′ W, depth 100 m.
28. v. 1898, 71° 19′ S, 87° 37′ W, depth 435 m.

These data are of great interest combined with the localities from the Discovery collections.

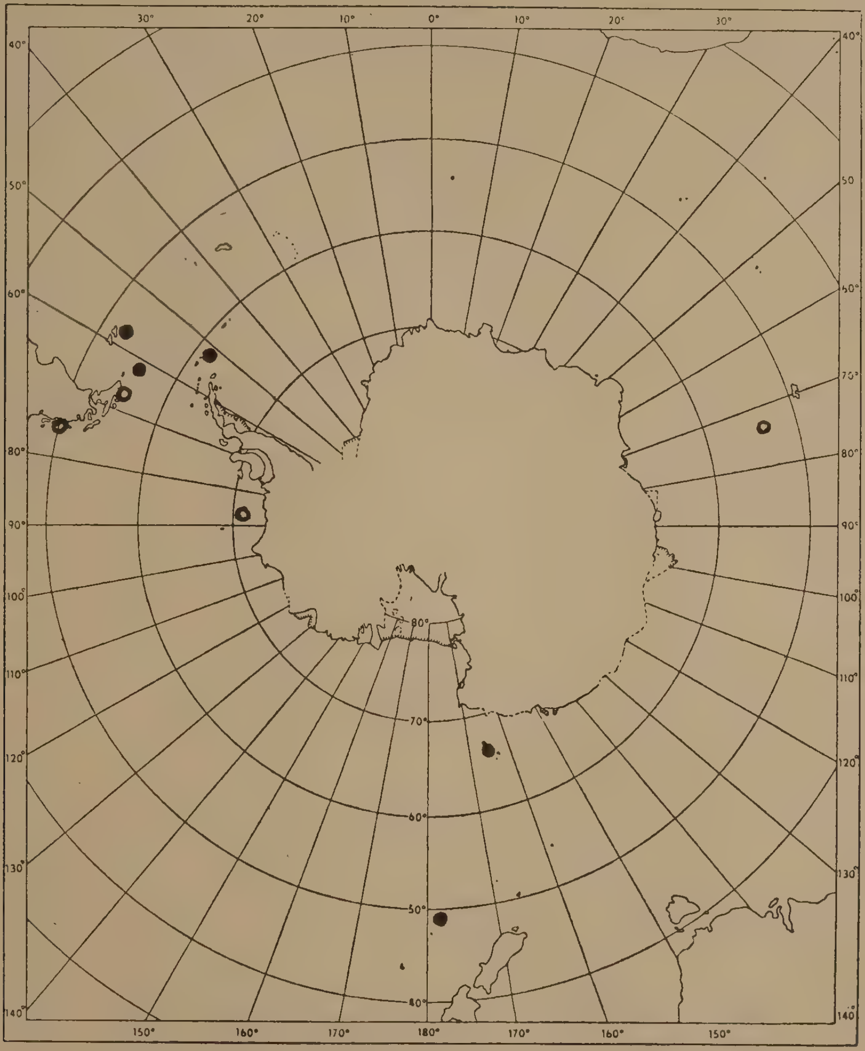


Fig. 12. The localities of Errina antarctica. Earlier known localities, open rings.

All localities with depths greater than 400 m. are situated south of the Antarctic Convergence; in sub-antarctic waters, on the other hand, the species has as yet only been met with at depths above 200 m. It must be mentioned here that no depth record exists concerning the two older localities, Cape Horn and Heard Island.

A series of new localities has been added by the Discovery Expedition (see Fig. 12). Allowing for the difficulties attendant on taking Stylasterids in the catches because of their special ecological demands, we can infer from the chart that the species probably has circumpolar distribution. None of the finds is located north of the Sub-tropical Convergence, which probably indicates the extreme limit of the habitat. The data are at present very scanty, and the deductions may appear a little hypothetical. But we can with certainty maintain that *E. antarctica* is a characteristic sub-antarctic and antarctic species, probably also cicumpolar.

According to data from the Norwegian *Brattegg* expedition in 1947–8, *E. antarctica* is comparatively common on the Burdwood Bank. The Burdwood Bank is also the home of another species of the genus, *E. spongiosa* Broch (1942), which was found by the Swedish Antarctic Expedition 1900–1 at a depth of 137–150 m. No other locality having been discovered as yet, the zoogeographical character of the species is somewhat uncertain; presumably, however, the species is endemic.

A third species of the genus, *E. moseleyi* Ridley (1881), at all events borders on the sub-antarctic region. It was also found by the *Alert* Expedition in the Madre-de-Dios Archipelago, but only in shallow water between 2 and 10 fathoms. Further details concerning this species are wanting.

Zoogeographically the Burdwood Bank and the Falkland Islands belong to the same sub-region as the southernmost coastal waters of South America. Besides the two *Errina* species, *Errinopsis reticulum* also appears to have its home in these waters, and it is therefore reasonable to maintain that according to our present data *Errina antarctica*, *E. spongiosa* and *Errinopsis reticulum* are endemic species of the sub-antarctic (antiboreal) regions. *Errina antarctica* also penetrates into the high-antarctic region and appears to be as numerous here as in the sub-antarctic region.

The collections also contain one representative of the sub-family Stylasteriinae, viz. *Conopora pauciseptata*, from St. 2493, position 42° 03·9′ S, 00° 03·5′ E, south of the Sub-tropical Convergence. The genus *Conopora* has previously only been found in the Indian and Pacific Oceans (Broch, 1942, p. 67, fig. 21), but must now also be added to the Atlantic fauna.

C. pauciseptata is recorded from parts of the oceans, where the bottom fauna has only been scantily explored in spite of its special interest. In benthic regions it is a problem where to draw the limit between sub-antarctic (anti-boreal) and sub-tropical areas, not only in South African and New Zealand waters but also along the coasts of South America, where the coastal shallow-water fauna has also been too insufficiently explored to allow of well-founded zoogeographical deductions. The locality at which *Conopora* was found indicates that it may be an inhabitant of the sub-tropical benthic regions.

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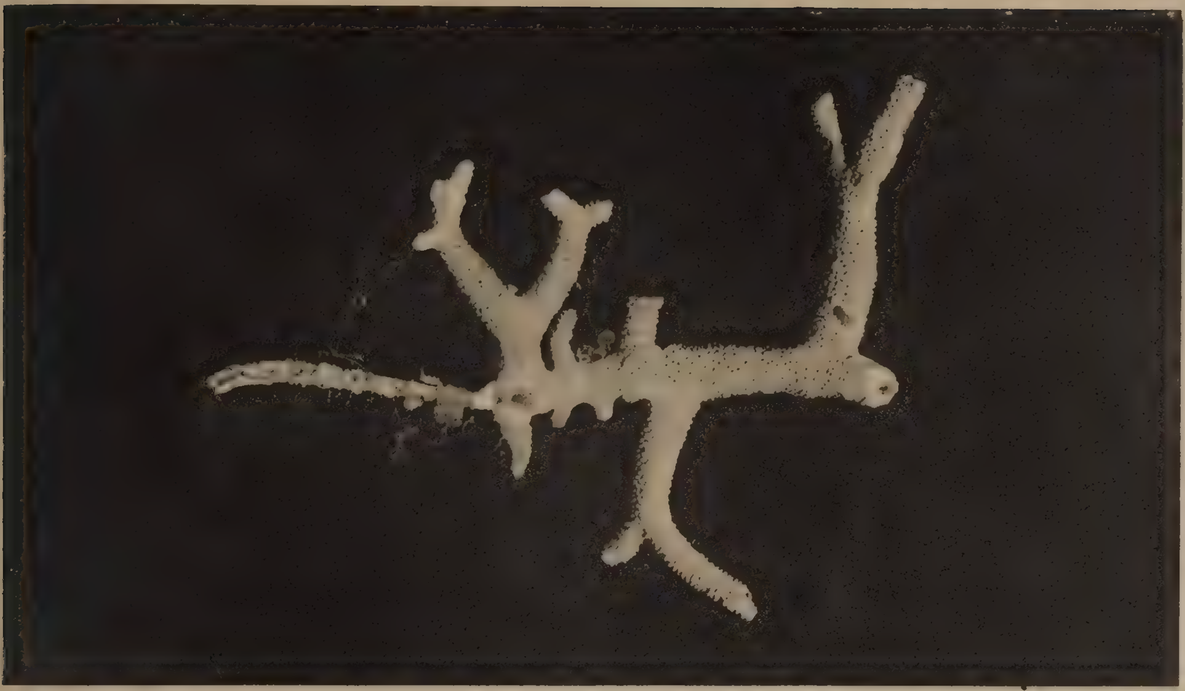
PLATE II

Fig. 1. **Errina antarctica** from St. 652, Burdwood Bank. Stout growth type. Nat. size.

Fig. 2. **Errinopsis reticulum**, ♂, type specimen from St. WS 246, south of Falkland Islands. Nat. size.



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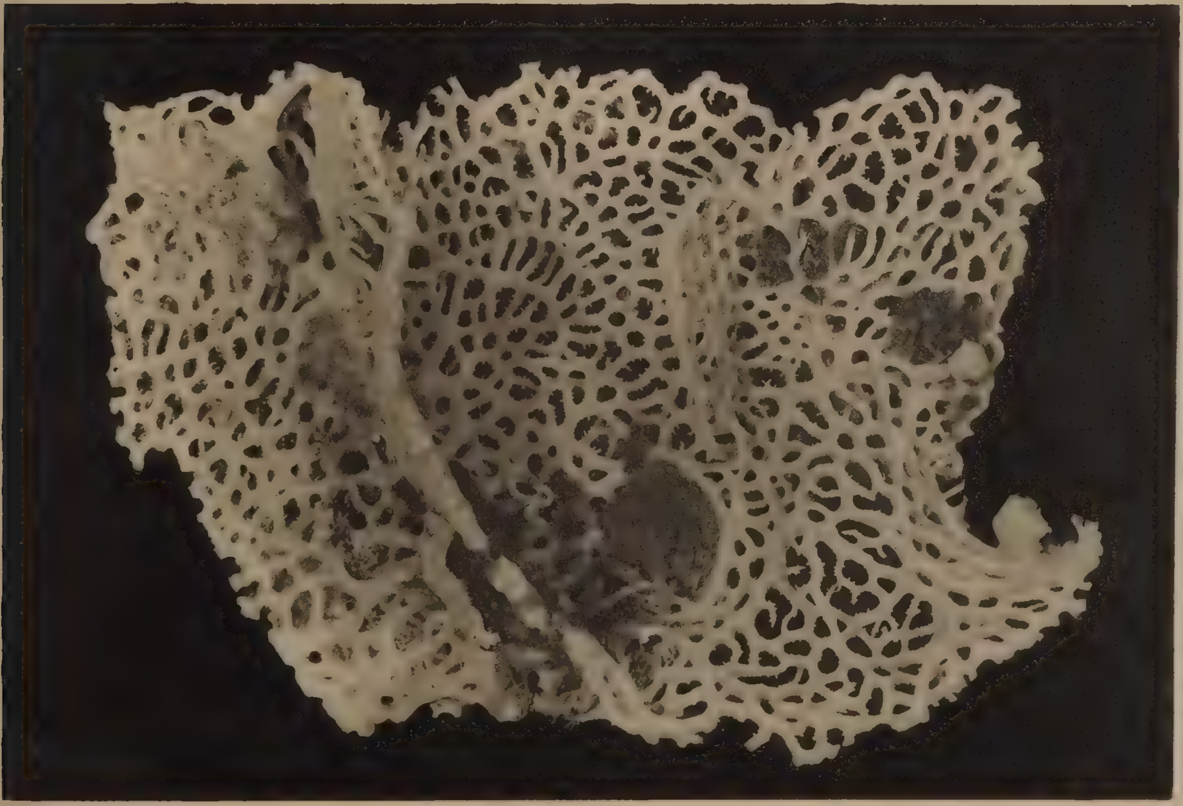

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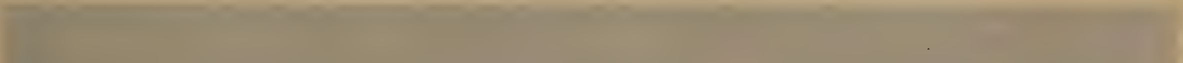
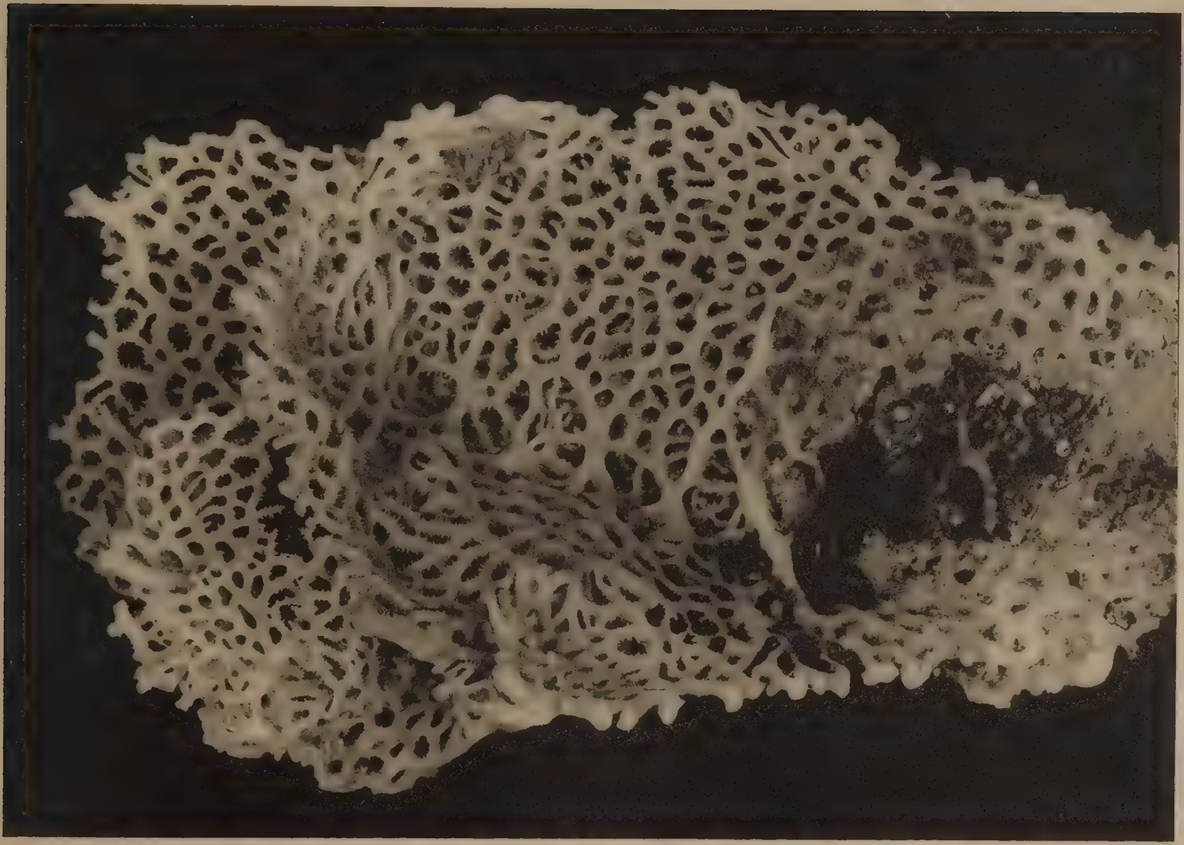


PLATE III

Fig. 1. **Errinopsis reticulum**, ♀, type specimen from St. WS. 246, south of Falkland Islands. Nat. size.

Fig. 2. **Errinopsis reticulum**, ♀, part of a branch showing surface structure. × 20.



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1. O. *Bache*, 2. B. *Christiansen phot.*

PLATE IV

Fig. 1. **Conopora pauciseptata.** Type specimen from St. 2493. Anterior side of the fragment. Nat. size.

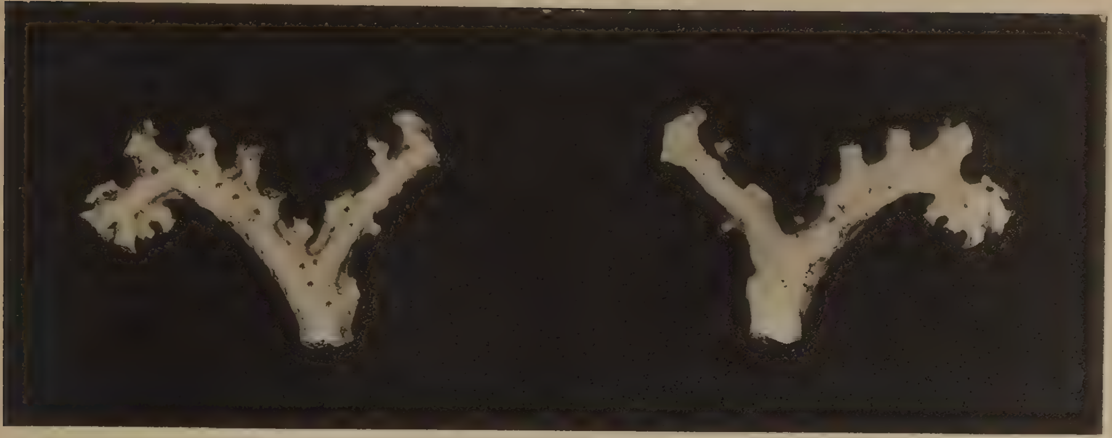
Fig. 2. **Conopora pauciseptata.** Type specimen from St. 2493. Posterior side of the fragment. Nat. size.

Fig. 3. **Errina antarctica** from St. 2200, Balleny Group. Living colony of the stout type, the median part incrusting the dead stem of an old, dead colony. Nat. size.

Fig. 4. **Errina antarctica** from St. 2200. Fragment of a dead colony of the common, flabelliform type with dichotomic ramification. Nat. size.

Fig. 5. **Errina antarctica** from St. 2200. Fragment of a dead, densely branching colony of the slender type. In spite of the prolific (subdichotomic) ramification and the bushy appearance anastomoses very seldom occur. Nat. size.

Fig. 6. **Errina antarctica** from St. 2200. Basal part of a great dead colony of the common, flabelliform type with subdichotomic ramification. Nat. size.



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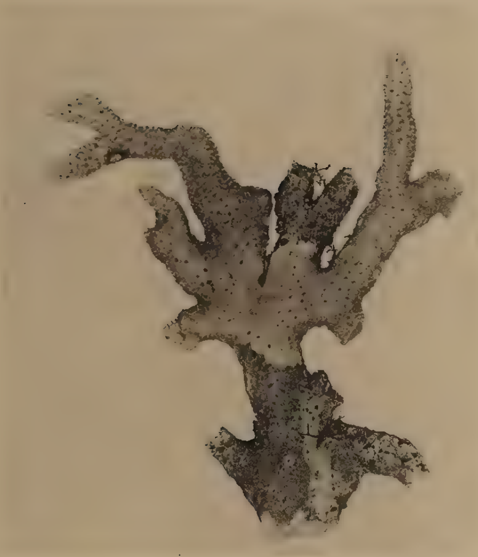

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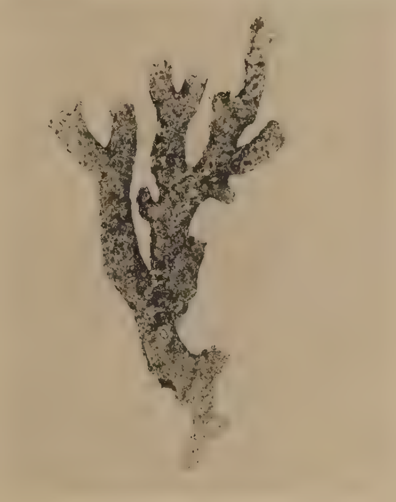

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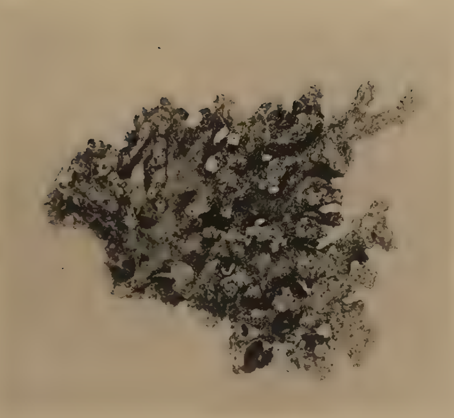

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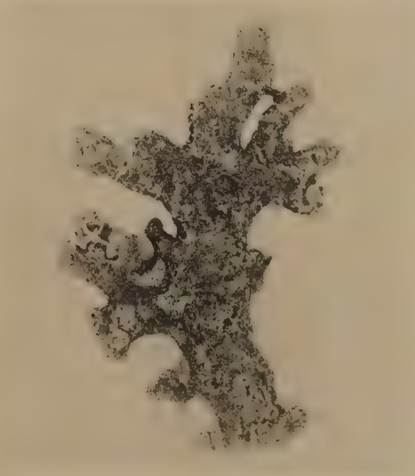

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O. Bache phot.

[*Discovery Reports. Vol. XXVI, pp.* 47–196, *Plates V–X, March,* 1951.]

LIFE SERVICE
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INVESTIGATIONS

ANTARCTIC AND SUBANTARCTIC MOLLUSCA: PELECYPODA AND GASTROPODA

By

A. W. B. POWELL, F.R.S.N.Z.

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ANTARCTIC AND SUBANTARCTIC MOLLUSCA: PELECYPODA AND GASTROPODA

COLLECTED BY THE SHIPS OF THE DISCOVERY COMMITTEE DURING THE YEARS 1926–1937

By A. W. B. Powell, F.R.S.N.Z.
Auckland Museum

(Plates V–X; Text-figs. A–N)

INTRODUCTION

THE material covered by this report is largely from the American Quadrant of the Antarctic and Subantarctic Zones, but with the addition of odd dredgings from Bouvet Island, Marion Island and the Ross Sea. My report covers the Gastropoda (with the exception of the Pteropoda and the Nudibranchiata) and some Pelecypoda. The Pteropoda were reported upon by Anne L. Massy (1932) and the Cephalopoda (in part) by G. C. Robson (1930).

The areas best represented by the Discovery collections are the Falkland Islands and the Patagonian Shelf, South Georgia and the higher latitudes of the Scotia Arc from the South Shetland Islands to the Palmer Archipelago.

The varied nature of these respective areas is ably described by E. Heron-Allen and A. Earland (1932) and A. Earland (1934) in their outstanding work on the Foraminifera. A description of the physical characteristics of each of the biogeographic areas concerned with the present collections follows.

FALKLAND ISLANDS

The Falklands are a group of two large and many small islands lying upon the very extensive East Patagonian Continental Shelf, but almost severed from it by the transverse Falkland Trough which lies at a depth of from 150 to 200 m. between two tongues of deep water which impinge both from the north and the south. The Falklands lie within the Subantarctic Zone of surface waters (isotherms between 6 and 12° C.), and are outside the northern limit of pack-ice. They are strongly influenced by the Cape Horn Current, composed largely of water of Pacific origin, which is swept through Drake Strait by the West Wind Drift and then turns northwards to the Falklands and resolves into the Falkland Current, which continues northward between the Falklands and Patagonia. The West Wind Drift proper passes well to the south of the Falklands. Owing to its position upon the Patagonian Shelf the Falkland marine molluscan fauna is predominantly Magellanic, and the terrestrial fauna, notably the presence of the fresh-water genus *Chilina*, points to a former land link with the Patagonian mainland.

North of the Falklands at the limit of the Continental Shelf, the bottom descends steeply to the Argentine Basin, which comes within the influence of the warm Brazilian Current, which there has a seasonal temperature range of from 11·5 to 14·5° C. (Hart, 1946, p. 243).

Another important factor influencing the Falkland fauna is the presence of the Atlantic-Indian cross-ridge which runs from the Argentine Basin almost to the Kerguelen-Gaussberg (radial) ridge and forms the northern boundary of the Atlantic-Antarctic Basin.

Deep water to the south effectively separates the Falklands from the Burdwood Bank and the rest of the extensive Scotia Arc.

The Falkland molluscan check list which follows is compiled from a number of published papers plus the Discovery Committee's material,* described in this report. The principal contributors to the Falkland fauna were Cooper and Preston (1910), Eliot (1907), Melvill & Standen (1907, 1912, 1914), Preston (1913), Smith (1915) and Strebel (1905–8).

Since the Falkland Islands are situated on the vast East Patagonian Continental Shelf it is not remarkable that the molluscan fauna of these islands is almost wholly Magellanic. A few species appear to be restricted to the Falklands, but their number is bound to be reduced as the Magellanic fauna becomes better known.

The marine molluscan fauna is Subantarctic with a strong admixture of continental temperate extralimital forms which have been induced to extend far south of their usual station through the continuity of the Patagonian land mass, which has many sheltered inlets, bays and channels.

One species of the characteristic Antarctic genus *Prosipho* occurs, but otherwise Antarctic forms are almost wholly absent.

Characteristic Subantarctic genera which are well represented are *Gaimardia*, *Cyamium*, *Nacella*, *Patinigera*, *Margarella*, *Laevilitorina*, *Pareuthria* and *Kerguelenella*.

The following instance temperate forms induced far south of their normal range: *Fissurella* (*Balboaina*), *Calliostoma*, *Polinices*, *Trochita*, *Nassarius*, *Acanthina*, *Typhis*, *Adelomelon* and *Marginella*.

Restricted Magellanic genera are the two Calliostomid derivatives *Photinula* and *Photinastoma*, the Trophonids *Xymenopsis*, *Fuegotrophon* and *Stramonitrophon*, and the Buccinoid genera *Savatieria*, *Anomacme* and *Meteuthria*.

The Atlantic-Indian Ocean cross-ridge has allowed an interchange of several genera and species between the Falklands and the Marion Island-Kerguelen area, notably *Trophon declinans*, *Provocator pulcher*, *Philine kerguelensis* and *Notoficula*. Also the range of two otherwise restricted Magellanic genera, *Glypteuthria* and *Parmaphorella*, has been extended thus to South African waters (Tomlin, 1932). This ridge has facilitated also the considerable eastern Subantarctic extension of the 'bipolar' genera *Fusitriton* and *Aforia*.

Falkland Islands Check List

This check list and those for other areas that follow are provisional only, since I have been unable to examine the actual material upon which many identifications were based. Nevertheless, these lists serve to give an approximate indication of the respective faunule for each biogeographic area. In most instances I have brought the nomenclature up to date, but in a few entries of doubtful taxonomic status the original record is cited, with quotation marks.

Species preceded by an asterisk are represented in the Discovery material; (T.) indicates that the type locality for the species is within the faunal area covered by the list, and the authorities following the names refer to the literature cited at the end of this report.

PELECYPODA

Nucula falklandica Preston, 1912 (T.).
N. pisum Sowerby, 1832; Melvill & Standen, 1914.
Yoldia eightsii (Couthouy, 1839) Melvill & Standen, 1914.
Y. woodwardi Hanley, 1860; Melvill & Standen, 1914.
Limopsis hardingii Melvill & Standen, 1914 (T.).
**L. hirtella* Rochebrune & Mabille, 1889.
'*Philobrya* sp.' Melvill & Standen, 1914.
'*Pecten*' *rufiradiatus* Reeve, 1853; Melvill & Standen, 1914.
Mytilus sp. Melvill & Standen, 1907, 1914 as '*edulis*' Linn.

Editor's Note: By no means all of the Discovery molluscan collections have been reported upon.

'*M. bifurcatus* Conrad' Melvill & Standen, 1914.
'*M. ovalis* Lamarck' Melvill & Standen, 1907.
Aulacomya magellanica Lamarck, 1819; Melvill & Standen, 1907, 1914.
Hormomya blakeana Melvill & Standen, 1914 (T.).
Anomia sp. Melvill & Standen, 1914 as '*ephippium*' Linn.
Gaimardia bennetti Preston, 1913 (T.).
G. exilis (H. & A. Adams, 1853); Melvill & Standen, 1914.
G. gemma (Cooper & Preston, 1910) (T.).
G. mesembrina Melvill & Standen, 1907 (T.) (= *G. picturata* Cooper & Preston, 1910) (T.).
G. trapesina (Lamarck, 1822); Melvill & Standen, 1914.
Cyamium antarcticum Philippi, 1845; Melvill & Standen, 1907.
C. bennetti Preston, 1912 (T.).
C. copiosum Preston, 1913 (T.).
C. cuneatum Preston, 1913 (T.).
C. exasperatum Preston, 1912 (T.).
C. falklandicum Melvill & Standen, 1898 (T.); Melvill & Standen, 1907, 1912, 1914.
C. iridescens Cooper & Preston, 1910 (T.).
C. piscium Preston, 1912 (T.).
C. stanleyense Preston, 1913 (T.).
Cyamionema decoratum Melvill & Standen, 1914 (T.).
Astarte longirostra d'Orbigny (T.).
Carditella naviformis Reeve, 1843; Melvill & Standen, 1914.
Lasaea consanguinea Smith, 1879; Melvill & Standen, 1907, 1914.
Lasaea sp. Melvill & Standen, 1914 as '*miliaris*' Philippi.
'*Kellia cycladiformis* Deshayes, 1851'; Melvill & Standen, 1907 1912, 1914.
Davisia bennetti Preston, 1912 (T.).
D. cobbi Cooper & Preston, 1910 (T.); Melvill & Standen 1914.
D. concentrica Preston, 1912 (T.).
Malvinasia arthuri Cooper & Preston, 1910 (T.).
?*Scacchia plenilunium* Melvill & Standen, 1907 (T.).
Thyasira falklandicus (Smith, 1885); Melvill & Standen, 1907, 1914.
Gomphina (*Acolus*) *foveolata* (Cooper & Preston, 1910) (T.); Melvill & Standen, 1914.
Samarangia exalbida Chemnitz, 1788; Melvill & Standen, 1907.
Darina solenoides King & Broderip, 1830–31; Melvill & Standen, 1914.
Cardium delicatulum Smith, 1915 (T.).
Lyonsia cuneata Gray, Melvill & Standen, 1907, 1914.
Mytilimeria falklandica Preston, 1913 (T.).
Laternula elliptica (King & Broderip, 1832) (= *Thracia antarctica* Melvill & Standen, 1898 (T.) = *Mya antarctica* Melvill & Standen, 1914 (T.)).
Solen macha Molina, 1789; Melvill & Standen, 1914.
Hiatella antarctica (Philippi, 1845); Melvill & Standen, 1914; Preston, 1913 as *Saxicava subantarctica* Preston.
Bankia odhneri Roch, 1931 (T.).
Cuspidaria (*Cardiomya*) *simillima* Smith, 1915.

GASTROPODA

**Patelloida ceciliana* (Orbigny, 1841) (T.); Melvill & Standen, 1907, 1914.
P. ceciliana magellanica (Strebel, 1907); Strebel, 1908; Melvill & Standen, 1914.
'*Acmaea inquilinus* Preston, 1913' (T.).
'*A. perconica* Preston, 1913' (T.).
Scurria scurra (Lesson, 1830); Melvill & Standen, 1914; Preston, 1913 as var. *charon* Preston.
'*Nacella falklandica* Preston, 1913' (T.).
N. mytilina (Helbling, 1779); Melvill & Standen, 1914.
**Patinigera aenea* (Martyn, 1784); Melvill & Standen as '*deaurata* Gmel.', 1907, 1914.

'*P. bennetti* (Preston, 1913)' (T.) (*Helcioniscus*) = ?*aenea*.
**P. delicatissima* (Strebel, 1907); Strebel, 1908; Melvill & Standen, 1914.
P. fuegiensis (Reeve, 1855); Melvill & Standen, 1907.
**Lepeta coppingeri* (Smith, 1881); Strebel, 1908.
**Fissurella* (*Balboaina*) *oriens* Sowerby, 1834; Melvill & Stand, 1907 as var. *mexicana* Sowb.; Strebel, 1908.
**F.* (*Balboaina*) *picta* (Gmelin, 1791); Melvill & Standen, 1907, 1914.
'*F. exquisita* Reeve', Strebel, 1908.
'*F. radiosa* (Lesson, 1826)'; Melvill & Standen, 1914+*polygona* Sowerby.
**Megatebennus patagonicus* Strebel, 1907; Strebel, 1908; Melvill & Standen, 1914.
**Puncturella conica* (d'Orbigny, 1841) (T.); Strebel, 1908 as *noachina*.
**Parmaphorella melvilli* (Thiele, 1912).
**Calliostoma falklandicum* Strebel, 1908 (T.).
**C. modestulum* Strebel, 1908 (T.); Melvill & Standen, 1912.
C. venustulum Strebel, 1908 (T.).
**Falsimargarita iris* (Smith, 1915) (T.).
**Photinula coerulescens* (King & Broderip, 1830–31); Strebel, 1908; Melvill & Standen, 1914.
**Photinastoma taeniata* (Wood, 1828) (T.); Melvill & Standen, 1907, 1914; Strebel, 1908.
**P. taeniata nivea* (Cooper & Preston, 1910) (T.).
**Margarella expansa* (Sowerby, 1838) (T.); Strebel, 1908; Melvill & Standen, 1907.
**M. violacea* (King & Broderip, 1830–31); Melvill & Standen, 1907, 1914.
'*M. solidula* (Cooper & Preston, 1910)' (T.) (*Photinula*).
'*M. solidula depressa* (Preston, 1913)' (T.) (*Photinula*).
**Solariella kempi* n.sp. (T.).
**Brookula calypso* (Melvill & Standen, 1912).
Laevilitorina bennetti Preston, 1912 (T.).
L. caliginosa (Gould, 1849); Melvill & Standen, 1907, 1914.
L. caliginosa aestualis Strebel, 1908 (T.).
L. latior Preston, 1912 (T.).
Subonoba grisea Martens, 1885; Strebel, 1908.
'*Rissoa inornata* Strebel, 1908' (T.).
Ovirissoa georgiana (Pfeffer, 1886); Strebel, 1908.
Eatoniella kerguelenensis contusa Strebel, 1908 (T.).
**Ataxocerithium pullum* (Philippi, 1845); Melvill & Standen, 1907, 1914; Strebel, 1908.
**Colpospirella algida* (Melvill & Standen, 1912).
**Mathilda malvinarum* Melvill & Standen, 1907 (T.); Strebel, 1908; Melvill & Standen, 1912.
Odostomia biplicata Strebel, 1908; Melvill & Standen, 1914.
Diacolax cucumariae Barth, 1946 (T.).
**Cirsotrema magellanica* (Philippi, 1845); Strebel, 1908.
**C. magellanica latecostata* (Strebel, 1905).
**Acirsa annectens* n.sp. (T.).
Amauropsis anderssoni Strebel, 1907 (T.).
Falsilunatia falklandica (Preston, 1913) (T.).
**F. recognita* (Rochebrune & Mabille, 1889).
**F. soluta* (Gould, 1848); Strebel, 1908.
Polinices patagonicus (Philippi, 1845); Strebel, 1908.
P. subantarcticus (Preston, 1913) (T.).
**Sinuber sculpta* (Martens, 1878) '*Form A*'.
**Tectonatica impervia* (Philippi, 1845); Melvill & Standen, 1914.
Lamellaria ampla Strebel, 1906; Melvill & Standen, 1914.
**L. elata* Strebel, 1907.
**L. patagonica* Smith, 1881.
**Lamellaria* sp.A.
Crepipatella dilatata (Lamarck, 1822); Melvill & Standen, 1907, 1914; Strebel, 1908 as var. *pallida*.

**Trochita clypeolum* (Reeve, 1859).
**T. trochiformis* (Gmelin, 1791) (T. ?); Strebel, 1908; Melvill & Standen, 1914.
**Fusitriton cancellatum* (Lamarck, 1822).
Pareuthria cerealis (Rochebrune & Mabille, 1889); Melvill & Standen, 1914.
**P. fuscata* (Bruguière, 1792) (T. ?); Melvill & Standen, 1907, 1914; Strebel, 1908; Preston, 1913 as *curta* Preston.
P. janseni (Strebel, 1905); Strebel, 1908.
**P. magellanica* (Philippi, 1848); Melvill & Standen, 1907, 1914.
**P. michaelseni* (Strebel, 1905); Melvill & Standen, 1907, 1914.
P. mulachi (Strebel, 1905); Melvill & Standen, 1914.
P. plumbea (Philippi, 1844); Melvill & Standen, 1914.
**P. ringei* (Strebel, 1905).
**P. rosea* (Hombron & Jacquinot, 1854); Strebel, 1908.
**P. scalaris* (Watson, 1882).
**Tromina bella* n.sp.
**T. fenestrata* n.sp.
**T. simplex* n.sp.
**Notoficula problematica* n.sp.
Glypteuthria acuminata Smith, 1915 (T.).
G. kobelti (Strebel, 1905); Melvill & Standen, 1914.
G. meridionalis (Smith, 1881); Melvill & Standen, 1914.
Anomacme smithi Strebel, 1905; Melvill & Standen, 1914.
Prosipho crassicostatus (Melvill & Standen, 1907); Melvill & Standen, 1914.
Savatieria areolata (Strebel, 1905); Melvill & Standen, 1914.
S. bertrandi Melvill & Standen, 1914 (T.).
S. molinae Strebel, 1905; Strebel, 1908.
Nassarius vallentini Melvill & Standen, 1907 (T.).
**Trophon declinans* Watson, 1882.
**T. geversianus* (Pallas, 1769); Melvill & Standen, 1907, 1914; Strebel, 1908.
T. malvinarum Strebel, 1908 (T.).
**T. ohlini* Strebel, 1904.
T. pelseneeri Smith, 1915 (T.).
T. philippianus Dunker, 1878; Melvill & Standen, 1907.
**T.* (*Stramonitrophon*) *laciniatus* (Martyn, 1789); Melvill & Standen, 1914.
T. (*Fuegotrophon*) *pallidus* (Broderip, 1833) (T.); (=*crispus* Gould) Melvill & Standen, 1907, 1914; Strebel, 1908.
**Xymenopsis albidus* (Philippi, 1846).
X. brucei (Strebel, 1904); Melvill & Standen, 1907.
X. couthouyi (Strebel, 1904); Strebel, 1908; Melvill & Standen, 1914.
X. decolor (Philippi, 1845); Strebel, 1908.
X. elegans (Strebel, 1904).
X. elongatus (Strebel, 1904); Strebel, 1908.
**X. falklandicus* (Strebel, 1908) (T.).
X. hoylei (Strebel, 1904); Melvill & Standen, 1907.
X. liratus (Gould, 1849); Melvill & Standen, 1907, 1914; Strebel, 1908.
X. ornatus (Strebel, 1904).
X. standeni (Strebel, 1904).
Acanthina calcar (Martyn, 1789); Melvill & Standen, 1914; Strebel, 1908.
Typhina belcheri (Broderip, 1832); (Smith, 1915).
**Admete magellanica* Strebel, 1905; Melvill & Standen, 1907, 1914.
**Adelomelon ancilla* (Solander, 1786); Melvill & Standen, 1907, 1914.
A. becki (Broderip, 1836).
A. ferussacii (Donovan, 1824).
**A. mangeri* (Preston, 1901) (T.).
A. martensi Strebel, 1906.

A. tuberculata (Swainson, 1822).
**Miomelon scoresbyana* n.sp.
**Provocator pulcher* Watson, 1882.
**Marginella warrenii* Marrat, 1876 (T., *hahni*).
**Belalora thielei* n.sp.
'*Bela*' *fulvicans* Strebel, 1908; Melvill & Standen, 1914.
'*B.*' *michaelseni* Strebel, 1905; Strebel, 1908.
**Pleurotomella anomalapex* n.sp. (T.)
**P.? ohlini* (Strebel, 1905).
**Aforia goniodes* (Watson, 1881).
**Leucosyrinx falklandica* n.sp.
**Eumetadrillia fuegiensis* Smith, 1888.
'*Aeolidia serotina* Bergh, 1874'; Eliot, 1907.
'*Cratena valentini* Eliot, 1907'.
Eubranchus falklandica (Eliot, 1907) '*Galvina*'.
'*Coryphella falklandica* Eliot, 1907'.
Necromantes challengeriana ((Bergh) Eliot, 1907) '*Tritonia*'.
'*Diaulula vestita* (Abraham, 1877)'; Eliot, 1907.
'*Staurodoris falklandica* Eliot, 1907'.
'*Acanthodoris falklandica* Eliot, 1907'.
**Acteon bullatus* (Gould, 1847).
**Toledonia perplexa* Dall, 1902.
**Philine falklandica* n.sp. (T.).
**P. kerguelensis* Thiele, 1925.
**Parvaplustrum tenerum* n.sp. (T.).
**Diaphana paessleri* (Strebel, 1905); Strebel, 1908.
Kerguelenella lateralis (Gould, 1846); Melvill & Standen, 1907, 1914.
Pachysiphonaria lessoni (Blainville, 1824); Melvill & Standen, 1914.
'*P. tristensis* (Leach, 1824)'; Strebel, 1908; Falkland Is. records unreliable according to Hubendick, 1946.

AMPHINEURA

Tonicia atrata (Sowerby, 1840); Melvill & Standen, 1907, 1914.
'*T. bennetti* Iredale, ms.' Melvill & Standen, 1914.
Icoplax punicea (Gould, 1846); Melvill & Standen 1907, 1914 as '*illuminatus*'.
Plaxiphora aurata (Spalowsky, 1795); Melvill & Standen, 1914 as '*carmichaelis*'.

CEPHALOPODA

Benthoctopus magellanicus Robson, 1930 (T.).
Octopus rugosus (Bosc, 1792); Robson, 1930.
O. tehuelchus d'Orbigny, 1835; Hoyle, 1912.

The following records are rejected:

(1) '*Anadara chemnitzi* Philippi', Smith, 1915.
(3) '*Cardium edule* Linn.', Melvill & Standen, 1914.
(2) '*Cryptogramma subimbricata* Sowerby', Melvill & Standen, 1914.
(3) '*Lacuna divaricata* Fabricius', Melvill & Standen, 1907.
(3) '*Mangilia costata* Donovan', Melvill & Standen, 1907.
(3) '*Retusa truncatula* Bruguière', Melvill & Standen, 1907.
(3) '*Rissoa parva*' Melvill & Standen, 1907.
(3) '*R.* (*Manzonia*) *zetlandica* Montagu', Melvill & Standen, 1907.
(3) '*Tellina squalida* Pulteney', Melvill & Standen, 1914.

(1) Probable error in Station number; off Rio de Janeiro most likely. (2) Central American species, probably from ship's ballast. (3) Common English species either accidentally introduced through shipping or from ballast.

BURDWOOD BANK

This is a large shoal of from 80 to 150 m. in depth situated south of the Falklands and separated from them by deep water, 500–2000 m. The shoal lies east of Tierra del Fuego, and it is now generally accepted that the line of folding represented by the Andes and their former continuity in what is now termed the Scotia Arc passed through the Burdwood Bank and not the Falkland Islands. A trough of moderately deep water, 250–500 m. severs the bank from Tierra del Fuego, and the ridge connecting it to the eastward with Shag Rocks and South Georgia varies between 1000 and 2000 m., severed in several places by deeper water of between 3000 and 4000 m. (Herdman, 1932, pp. 205–36).

From his studies on fossil Foraminifera dredged from the Burdwood Bank, Macfadyen (1933) states on p. 16 in summarizing these fossil occurrences that the 'beds are clearly shown to be the continuation of those exposed on Tierra del Fuego and Staten Island, and a part of the (renamed) Scotia Arc of folding, which is continued on a trend precisely determined by soundings to lie on the line of the Shag Rocks, South Georgia, Clerke Rocks, South Sandwich Islands, South Orkney Islands to the South Shetlands and Graham Land'.

Only a small molluscan list of fifty-five species is available for this area (Melvill & Standen, 1912, and the Discovery Committee's Collections), but at least thirteen species are apparently restricted to the locality. Of the remainder, fifteen are found in the Falkland Islands, but only three of them, *Davisia cobbi*, *Brookula calypso* and *Colpospirella algida*, are not generally distributed in the Magellanic Province. The bulk of the fauna is Magellanic, but four Antarctic species, *Schizotrochus euglyptus*, *Pellilitorina pellita*, *Balcis antarctica* and *Paradmete fragillima*, here apparently reach their northern limit for the American Quadrant.

Burdwood Bank Check List

PELECYPODA

- *Hochstetteria sublaevis* (Pelseneer, 1903); Melvill & Standen, 1912.
- *H. wandelensis* (Lamy, 1906); Melvill & Standen, 1912.
- '*Crenella decussata* Montagu 1808' Melvill & Standen, 1912; probably not this European species.
- *Cyamium denticulatum* Smith, 1907; Melvill & Standen, 1912.
- *Carditella pallida duodecimcostata* Melvill & Standen, 1912 (T.).
- *Venericardia congelascens* Melvill & Standen, 1912 (T.).
- *Astarte magellanica* Smith, 1881; Melvill & Standen, 1912.
- '*Diplodonta lamellata* Smith, 1881'; Melvill & Standen, 1912.
- *Davisia cobbi* Cooper & Preston, 1910; Melvill & Standen, 1912.
- '*Kellyia cycladiformis* Deshayes, 1855'; Melvill & Standen, 1912.
- '*K. magellanica* Smith, 1881'; Melvill & Standen, 1912.

GASTROPODA

- *Schizotrochus euglyptus* (Pelseneer, 1903); Melvill & Standen, 1912.
- *Scissurella eucharista* Melvill & Standen, 1912 (T.).
- *S. supraplicata* Melvill & Standen, 1912 (T.).
- *Parmaphorella melvilli* (Thiele, 1912); Melvill & Standen, 1907 (T.).
- *Puncturella conica* (d'Orbigny, 1841); Melvill & Standen, 1912.
- *Calliostoma modestulum* Strebel, 1908; Melvill & Standen, 1912.
- *Brookula calypso* (Melvill & Standen, 1912) (T.).
- *Liotella coatsianum* (Melvill & Standen, 1912) (T.).
- '*Cyclostrema*' *gaudens* Melvill & Standen, 1912 (T.).
- *Subonoba fuegoensis* (Strebel, 1908); Melvill & Standen, 1912.
- *S. paucilirata* (Melvill & Standen, 1912) (T.).
- *S. sulcata* Strebel, 1908; Melvill & Standen, 1912.
- *S. turqueti* (Lamy, 1906); Melvill & Standen, 1912.

'*Homalogyra atomus burdwoodianus* Strebel, 1908' (T).
Pellilitorina pellita (Martens, 1885); Melvill & Standen, 1912.
*_Ataxocerithium pullum_ (Philippi, 1845); Melvill & Standen, 1912.
'*Bittium*' *burdwoodianum* Melvill & Standen, 1912 (T.).
Cerithiopsis macroura Melvill & Standen, 1912 (T.).
Colpospirella algida (Melvill & Standen, 1912) (T.).
Mathilda rhigomaches Melvill & Standen, 1912 (T.).
Balcis antarctica (Strebel, 1908); Melvill & Standen, 1912.
'*Turbonilla*' *smithi* Strebel, 1905; Melvill & Standen, 1912.
'*T.*' *xenophyes* Melvill & Standen, 1912 (T.).
'*Trichotropis bruceana* Melvill & Standen, 1916' n.nom. for *T. antarctica* Melvill & Standen, 1912, non Thiele, 1912 (T.).
Tectonatica impervia (Philippi, 1845); Melvill & Standen, 1912.
*_Trochita trochiformis_ (Gmelin, 1791); probably covers '*Calyptraea chinensis*' of Melvill & Standen, 1912.
*_T. clypeolum_ Reeve, 1859.
Cirsotrema magellanica (Philippi, 1845); Melvill & Standen, 1912.
Trophon philippianus Dunker, 1878; Melvill & Standen, 1912.
T. (*Fuegotrophon*) *pallidus* (Broderip, 1832); Strebel, 1908 as *crispus burdwoodianum* (T.).
Xymenopsis falklandicus Strebel, 1908; Melvill & Standen, 1912.
Antistreptus magellanicus Dall, 1902; Melvill & Standen 1912.
*_Pareuthria ringei_ (Strebel, 1905).
P. rosea (Hombron & Jacquinot, 1854); Melvill & Standen, 1912.
Savatieria concinna Melvill & Standen, 1912.
Paradmete fragillima (Watson, 1882); Melvill & Standen, 1912 as *typica* Strebel, 1908.
'*Mitra* (*Volutomitra*) *porcellana* Melvill & Standen, 1912'; probably a *Marginella*.
*_Leucosyrinx paragenota_ n.sp.
'*Bela anderssoni* Strebel, 1908'; Melvill & Standen, 1912.
'*B. fulvicans* Strebel, 1908'; Melvill & Standen, 1912.
Toledonia limnaeaeformis (Smith, 1879); Melvill & Standen, 1912.
'*Retusa truncatula* (Bruguière)' Melvill & Standen, 1912; probably not this European species.

CEPHALOPODA

Octopus brucei Hoyle, 1912 (T.).
Benthoctopus sp. Robson, 1930.

SOUTH GEORGIA AND SHAG ROCKS

This very distinctive biogeographic unit lies from 12 to 20° east of the Burdwood Bank and is part o the Scotia Arc, although it is surrounded by deep water, 3000 m. As pointed out by Earland (1933 p. 29), South Georgia is located in only slightly higher latitudes (54–55° S.) than the Falkland (51°–52° 30′ S), yet the contrast in both their physical conditions and their respective faunas i profound.

The Falklands are situated on the Patagonian Shelf, not the Scotia Arc, and the surrounding water are ice-free, being out of the influence of the cold West Wind Drift. South Georgia, on the other hand is an isolated area in a region of deep water, entirely within the influence of the cold West Wind Drif and even land conditions are glacial. Partially resolving upon these conditions the bottom sediment are mainly tenacious blue muds in contrast to the sandy deposits of the Falkland area and the coars sandy and often volcanic debris of the South Sandwich—South Shetland section of the Scotia Arc Owing to the far southward extension of the South American land mass the Antarctic Convergence i forced below its average latitude, with the result that the Falklands lie in the Subantarctic and Sout Georgia, since it is well to the eastward, comes within the Antarctic zone of surface waters.

Regarding the Foraminifera, Earland (1934, p. 8) remarked that 'In its isolation, South Georgia as either preserved or developed species which are almost confined to the island'.

The molluscan fauna has scarcely any species common to the Falklands. On the other hand, the resent collections include a number of genera and species previously considered characteristic of the erguelen and the Ross Sea areas. Their significance, however, is partly ecological, in that the blue uds of South Georgia are more comparable with the Ross Sea bottom than they are with the coarse andy bottom of the shallower areas of much of the Scotia Arc. This would account for the presence in outh Georgia of the antarctic species *Trichoconcha mirabilis*, but its apparent absence from other cotia Sea localities.

A physical factor which must have the effect of distributing Ross and Victorian Quadrant species astward into the Weddell Quadrant is the East Wind Drift which operates contrary to the West Wind rift at and below 65° S.

The South Georgian fauna must now be fairly completely known. It is very distinctive, and as lready noted has little in common with that of the Falklands, which are almost of the same latitude. There are several endemic genera; *Venustatrochus*, *Promargarita*, *Pfefferia*, *Chlanidotella* and *avineptunea*. Antarctic genera and species are strongly represented: *Patinigera polaris*, *Laevilacunaria*, *richoconcha*, *Prosipho*, *Chlanidota*, *Probuccinum* and *Neactaeonina*. The widely distributed Antarctic-ubantarctic genera *Gaimardia* and *Margarella* are represented almost entirely by endemic species.

The characteristic Magellanic genera *Nacella*, *Photinula*, *Photinastoma*, *Xymenella* and *Adelomelon* re not represented. Evidence, however, that the Scotia Arc was formerly a more effective route than t present for the southward spread of the Magellanic fauna is shown by the presence of a *Trochita georgiana* n.sp.) and a derivative of *Calliostoma* (*Venustatrochus georgianus* n.gen. and n.sp.). Deep-ater severing of the arc has culminated by isolation in the development of the South Georgian fauna s a distinctive unit.

On the other hand, there is a strong representation of both eastern Subantarctic and Antarctic forms haracteristic of the Victoria and Enderby Quadrants: *Pellilitorina setosa*, *Amauropsis* (*Kerguelenatica*) *risea*, *Perissodonta georgiana*, *Sinuber*, *Falsimohnia*, *Proneptunea*, *Trichoconcha*, *Probuccinum* and *rosipho hunteri*.

South Georgia Check List

ELECYPODA

Nucula minuscula Pfeffer, 1886 (T.).
Lissarca miliaris (Philippi, 1845); David, 1934.
L. rubrofusca Smith, 1875; Martens & Pfeffer, 1886; David, 1934.
Hochstetteria quadrata (Pfeffer, 1886) (T.).
H. ungulata (Pfeffer, 1886) (T.).
Cyamium imitans Pfeffer, 1886; David, 1934.
C. willii Pfeffer, 1886 (T.) (=*mosthaffi* Pfeffer, David, 1934).
Cyamionema decoratum Melvill & Standen, 1914; David, 1934.
Gaimardia faba (Pfeffer, 1886) (T.).
G. nigromarginata (Pfeffer, 1886) (T.).
G. subquadrata (Pfeffer, 1886) (T.).
G. trapesina (Lamarck, 1822); Martens & Pfeffer, 1886.
Kidderia bicolor (Martens, 1885) (T.); David, 1934.
Mysella charcoti (Lamy, 1906); David, 1934.
'*Lepton*' *costulatum* Martens, 1885 (T.).
'*Lyonsia*' *arcaeformis* Martens, 1885 (T.).
Hiatella antarctica (Philippi, 1845); Martens & Pfeffer, 1886; David, 1934.
Laternula elliptica (King & Broderip, 1832); David, 1934.

GASTROPODA

***Schizotrochus euglyptus* (Pelseneer, 1903).
**Patinigera polaris* (Hombron & Jacquinot, 1841) (T.); Strebel, 1908; David, 1934.
**P. polaris concinna* (Strebel, 1908) (T.).
**Puncturella conica* (d'Orbigny, 1841).
**Venustatrochus georgianus* n.sp. (T.).
**Margarella jason* n.sp. (T.).
M. notalis Strebel, 1908 (T.).
**M. steineni* (Strebel, 1905) (T.); Strebel, 1908; David, 1934.
M. subantarctica Strebel, 1908 (T.).
**M.* (*Promargarita*) *achilles* (Strebel, 1908) (T.).
**M.* (*Promargarita*) *tropidophoroides* (Strebel, 1908) (T.); David, 1934.
**M.* (*Promargarita*) *tropidophoroides obsoleta* n.subsp. (T.).
**Submargarita impervia* Strebel, 1908 (T.).
**Tropidomarga biangulata* n.sp. (T.).
Microdiscula subcanaliculata (Smith, 1875); (*Skenea*) Strebel, 1908.
**Brookula pfefferi* n.sp. (T.).
**B. strebeli* n.sp. (T.).
**Leptocollonia thielei* n.sp. (T.).
**Laevilitorina caliginosa* (Gould, 1849); Strebel, 1908; David, 1934.
L. granum Pfeffer, 1886 (T.).
L. pygmaea Pfeffer, 1886 (T.); Strebel, 1908.
L. umbilicata Pfeffer, 1886 (T.).
L. venusta Pfeffer, 1886 (T.).
Laevilacunaria antarctica (Martens, 1885) (T.); Strebel, 1908; David, 1934.
**Pellilitorina pellita* (Martens, 1885) (T.); Strebel, 1908; David, 1934.
**P. setosa* (Smith, 1875) Strebel, 1908; David, 1934.
'*Hydrobia*' *georgiana* Pfeffer, 1886 (T.).
Ovirissoa anderssoni (Strebel, 1908) (T.).
O. insignificans (Strebel, 1908) (T.).
**O. georgiana* (Pfeffer, 1886) (T.); Strebel, 1908.
Subonoba grisea (Martens, 1885) (T.).
**Subonoba* cf. *paucilirata* (Melvill & Standen, 1912).
S. schraderi (Strebel, 1908) (T.).
S. steineni (Strebel, 1908) (T.).
S. sulcata (Strebel, 1908) (T.).
**Eatoniella kerguelenensis major* Strebel, 1908 (T.).
E. kerguelenensis contusa Strebel, 1908.
E. subgoniostoma Strebel, 1908 (T.); David, 1934.
Skenella georgiana Pfeffer, 1886 (T.); Strebel, 1908.
**Cerithiella seymouriana* (Strebel, 1908).
Cerithiopsilla bisculpta (Strebel, 1908) (*Bittium*) (T.).
C. georgiana (Pfeffer, 1886) (*Cerithium*) (T.).
**Colpospirella algida* (Melvill & Standen, 1912) (*Turritella*).
'*Liostomia*' *georgiana* Pfeffer, 1886 (T.).
Odostomia translucens (Strebel, 1908) (T.) (*Volutaxiella*).
Streptocionella singularis Pfeffer, 1886 (T.).
Balcis subantarctica (Strebel, 1908) (T.) (*Volutaxiella*).
**Cirsotrema fenestrata* (Strebel, 1908) (T.).
**Amauropsis anderssoni* (Strebel, 1907); Strebel, 1908.
**A. aureolutea* (Strebel, 1908) (T.).
A. georgianus (Strebel, 1908) (T.).

A. (*Kerguelenatica*) *grisea* (Martens, 1878); Strebel, 1908; David, 1934.
**Polinices patagonicus* (Philippi, 1845).
**Sinuber sculpta scotiana* n.subsp.
**Tectonatica impervia* (Philippi, 1845).
**Marseniopsis pacifica* Bergh, 1886.
**Trochita georgiana* n.sp. (T.).
**Trichoconcha mirabilis* Smith, 1907.
**Perissodonta georgiana* Strebel, 1908 (T.).
**Falsimohnia albozonata* (Watson, 1882); David, 1934.
**Prosipho astrolabiensis* (Strebel, 1908).
**P. chordatus* (Strebel, 1908) (T.).
**P. hunteri* Hedley, 1916.
**P. perversus* n.sp. (T.).
**Chlanidota densesculpta* (Martens, 1885) (T.); Strebel, 1908; David, 1934.
**C. paucispiralis* n.sp. (T.).
Pfefferia chordata Strebel, 1908 (T.).
**P. cingulata* Strebel, 1908 (T.).
**P. elata* Strebel, 1908 (T.).
P. palliata Strebel, 1908 (T.).
**Probuccinum angulatum* n.sp. (T.).
**P. delicatulum* n.sp. (T.).
**Cavineptunea monstrosa* n.sp. (T.).
**Chlanidotella modesta* (Martens, 1885) (T.); Strebel, 1908; David, 1934.
**Proneptunea duplicarinata* n.sp. (T.).
**P. fenestrata* n.sp. (T.).
**Trophon albolabratus* Smith, 1875; Strebel, 1908.
**T. brevispira* Martens, 1885 (T.); Strebel, 1908; David, 1934.
T. cribellum Strebel, 1908 (T.); David, 1934.
**T. cuspidarioides* n.sp. (T.).
T. distantelamellatus Strebel, 1908 (T.).
**T. minutus* Melvill & Standen, 1907.
**T. scotianus* n.sp. (T.).
**T. shackletoni paucilamellatus* n.subsp. (T.).
Paradmete curta Strebel, 1908 (T.).
**P. fragillima* (Watson, 1882) (=*typica* Strebel, 1908, T.).
**P. longicauda* Strebel, 1908 (T.).
**Admete antarctica* Strebel, 1908.
**A. consobrina* n.sp. (T.).
**Belaturricula turrita* (Strebel, 1908) (T.).
**Lorabela notophila* (Strebel, 1908) (T.).
**L. pelseneri* (Strebel, 1908) (T.).
'*Bela*' *anderssoni minor* Strebel, 1908 (T.).
'*Bela*' *fulvicans* Strebel, 1908 (T.).
Pleurotomella bathybia Strebel, 1908 (T.).
**Typhlodaphne purissima* (Strebel, 1908) (T.).
Cleodora sulcata (Pfeffer, 1879); Massy, 1932.
Limacina helicina (Phipps, 1774); Massy, 1932.
L. balea (Moeller, 1841) Massy, 1932.
Clione antarctica Smith, 1902; Massy, 1932.
Spongiobranchaea australis d'Orbigny, 1840; Massy, 1932.
'*Aeolis antarctica* Pfeffer, 1886'.
'*A. georgiana* Pfeffer, 1886'.
'*A. schraderi* Pfeffer, 1886'.

'*Tritonia antarctica* Pfeffer, 1886'.
**Neactaeonina cingulata* (Strebel, 1908) (T.).
**N. edentula* (Watson, 1883).
**Toledonia punctata* Thiele, 1912.
**Philine gibba* Strebel, 1908 (T.).
'*Cylichna*' *cumberlandiana* Strebel, 1908 (T.).
Cylichnina georgiana Strebel, 1908 (T.).
**Kaitoa scaphandroides* n.sp. (T.).
Diaphana anderssoni (Strebel, 1908) (T.).
D. antarctica (Pfeffer, 1886) (T.).
D. inflata (Strebel, 1908) (T.).
D. pfefferi (Strebel, 1908) (T.).
**Kerguelenella lateralis* (Gould, 1846).

AMPHINEURA

Terenochiton kerguelenensis (Haddon, 1886) (=*Leptochiton pagenstecheri* Martens & Pfeffer 1886, T.).
Hemiarthrum setulosum (Dall, 1878) Martens & Pfeffer, 1886; David, 1934.
Icoplax steinenii Pfeffer, 1886 (T.).
Tonicina zschaui (Pfeffer, 1886) David, 1934.

CEPHALOPODA

Graneledone charcoti Joubin, 1905; Robson, 1930.
G. turqueti Joubin, 1905; Robson, 1930.
G. polymorpha Robson, 1930 (T.).
Thaumeledone gunteri Robson, 1930 (T.).

SOUTH SANDWICH ISLANDS AND REMAINDER OF SCOTIA ARC

Earland (1934), on the basis of the distribution of the Foraminifera, has divided this section of the Antarctic into the following faunal areas: (1) Weddell Sea; (2) South Sandwich Islands; (3) South Orkney Islands to Clarence Island on the Continental Shelf and Slope; (4) Scotia Sea from 29° 15′ to 60° W; (5) Drake Strait from 60° W; (6) Bransfield Strait and South Shetland Islands; (7) Palmer Archipelago; (8) Bellingshausen Sea.

The whole area is within Antarctic waters, and most of it is either on the Antarctic Continental Shelf or tied to it through the Scotia Arc, which links with Graham Land.

I have added a number of species to the faunal list of the South Sandwich-Palmer Archipelago section of the Scotia Arc, but even now our knowledge of the molluscs of this area is too scanty to reveal any marked molluscan segregation, so for the present the area mentioned above is treated as one faunal unit.

The molluscan list is made up as follows: South Sandwich Islands, 12 species; South Orkneys, 48 species; South Shetlands, 35 species; Palmer Archipelago, 20 species; with a total of 93 species for the four areas, obviously an incomplete list. Contrary to the foraminiferal evidence, a number of molluscs are found to be common to two or more of Earland's eight areas.

Regarding the above four localities provisionally as a whole, there are three marked influences apart from an apparently endemic faunule: (1) South Georgian, (2) Kerguelen, and (3) eastern Antarctic.

The South Georgian influence is represented by *Tropidomarga biangulata*, *Leptocollonia thielei*, *Pellilitorina pellita*, *Eationiella kerguelenensis major*, *Amauropsis aureolutea*, *Sinuber sculpta scotiana*, *Prosipho astrolabiensis*, *Trophon minutus*, *T. shackletoni paucilamellatus* and *Neactaeonina cingulata*, although perhaps some of the above-mentioned species would be more correctly regarded as a Weddell influence in the South Georgian fauna.

The Kerguelen influence is shown by *Pellilitorina setosa*, *Amauropsis* (*Kerguelenatica*) *grisea*, *Marseni-sis pacifica*, *Paradmete fragillima* and *Neactaeonina edentula*.

Finally, the eastern Antarctic (Enderby and Victoria Quadrants) influence is provided by *Falsi-argarita gemma*, *Antimargarita dulcis*, *Subonoba fraudulenta*, *Balcis solitaria*, *Neobuccinum eatoni*, *rosipho madigani*, *Acteon antarcticus*, *Philine alata* and *Toledonia major*.

Many of these correlatives are of deep-water occurrence, and in consequence are not restricted by e deep-water breaks in the Scotia Arc. The occurrence of the Magellanic genus *Tromina* may be counted for in this manner.

It will serve no useful purpose to name the apparently endemic species for this group of islands, since rther collecting will probably show many of them to be of wider range than our present knowledge dicates. The ultimately acceptable endemic species will be found amongst those indicated in the spective locality columns by 'T.', which signifies type locality. Localization in *Chlanidota* at least is own by the occurrence of three species not recorded from elsewhere.

In this list an asterisk, as before, indicates that the species occurs in the Discovery collections, 'L.' fers to Lamy's 1906 paper, 'M. & S.' to Melvill & Standen's 1907 and 1912 papers, 'M.' to Massy 920), 'R.' to Robson (1930), and 'Th.' to Thiele (1912).

South Sandwich Islands, South Orkneys, South Shetland Islands and Palmer Archipelago Check List

ELECYPODA	S. Sand.	S. Ork.	S. Shet.	Palm.
Nucula minuscula Pfeffer, 1886	—	M. & S.	—	—
Yoldia eightsi (Couthouy, 1839)	—	M. & S.	—	—
Y. inaequisculpta Lamy, 1906	—	T.	—	—
Y. woodwardi Hanley, 1860	—	L.	—	—
Lissarca bennetti Preston, 1916	—	—	T.	—
L. miliaris (Philippi, 1845)	—	Th.	—	—
L. notorcadensis Melvill & Standen, 1907	—	T.	—	—
L. rubrofusca Smith, 1879	—	M. & S.	—	—
Limatula deceptionensis Preston, 1916	—	—	T.	—
L. pygmaea (Philippi, 1845)	—	M. & S.	—	—
Hochstetteria meridionalis (Smith, 1885)	—	M. & S.	—	—
H. quadrata (Pfeffer, 1886)	—	M. & S.	—	—
H. wandelensis (Lamy, 1906)	—	M. & S.	—	—
Palliolum pteriola Melvill & Standen, 1907	—	T.	—	—
Thyasira falklandica (Smith, 1885)	—	M. & S.	—	—
Lasaea consanguinea (Smith, 1879)	—	M. & S.	—	—
Mysella flavida (Preston, 1916)	—	—	T.	—
'*Kellia*' *lamyi* Melvill & Standen, 1907	—	M. & S.	—	—
Cyamiomactra laminifera (Lamy, 1906)	—	T.	—	—
Laternula elliptica (King & Broderip, 1832)	—	Th.	Th.	—
ASTROPODA				
**Schizotrochus euglyptus* (Pelseneer, 1903)	—	—	—	*
Scissurella timora Melvill & Standen, 1912	—	T.	—	—
**Puncturella conica* (d'Orbigny, 1841)	—	—	*	—
**Patinigera polaris* (Hombron & Jacquinot, 1841)	—	*	*	*
**Falsimargarita gemma* (Smith, 1915)	—	—	*	—
**Antimargarita dulcis* (Smith, 1907)	—	—	*	—
**Tropidomarga biangulata* Powell n.sp.	—	—	*	—
**Margarella antarctica* (Lamy, 1905)	—	T.*	*	*

	S. Sand.	S. Ork.	S. Shet.	Palm.
*_Leptocollonia thielei_ n.sp.	—	—	—	*
'_Cyclostrema' meridionale_ Melvill & Standen, 1912	—	T.	—	—
*_Laevilitorina claviformis_ Preston, 1916	—	—	T.	*
*_L._ (_Corneolitorina_) _coriacea_ (Melvill & Standen, 1907)	—	—	T.*	—
*_Laevilacunaria bransfieldensis_ (Preston, 1916)	—	—	T.*	—
*_L._ (_Pellilacunella_) _bennetti_ (Preston, 1916)	—	—	T.	*
*_Pellilitorina pellita_ (Martens, 1885)	—	*	—	—
P. setosa (Smith, 1875)	—	M. & S.	—	—
Subonoba deserta (Smith, 1907)	—	M. & S.	—	—
*_S. fraudulenta_ (Smith, 1907)	—	*	—	—
Ovirissoa adarensis (Smith, 1902)	—	M. & S.	—	—
O. scotiana (Melvill & Standen, 1907)	—	T.	—	—
'_Rissoa' edgariana_ Melvill & Standen, 1907	—	T.	—	—
'_Rissoa' filostria_ Melvill & Standen, 1912	—	T.	—	—
Eatoniella kerguelenensis major Strebel, 1908	—	M. & S.	—	—
Cerithiopsilla georgiana (Pfeffer, 1886)	—	M. & S.	—	—
*_Cerithiella astrolabiensis_ (Strebel, 1908)	*	—	—	—
*_Turritellopsis thielei_, n.sp.	—	—	—	T.
*_Balcis antarctica_ (Strebel, 1908)	*	—	—	—
*_Balcis_ cf. _solitaria_ (Smith, 1915)	—	—	—	*
*_Balcis_ cf. _tumidula_ (Thiele, 1912)	—	*	—	—
*_Amauropsis aureolutea_ (Strebel, 1908)	*	—	*	—
A. bransfieldensis (Preston, 1916)	—	—	T.	—
A. godfroyi (Lamy, 1910)	—	—	T.	—
*_A._ (_Kerguelenatica_) _grisea_ (Martens, 1878)	—	—	*	—
*_Sinuber sculpta scotiana_ n.subsp.	—	T.	—	
*_Marseniopsis pacifica_ Bergh, 1886	—	*	—	*
Prolacuna notorcadensis (Melvill & Standen, 1907)	—	T.	—	—
*_Antitrichotropis wandelensis_ (Lamy, 1906)	—	—	*	T.
*_Discotrichoconcha cornea_ n.gen and n.sp.	—	—	—	T.
*_Chlanidota elongata_ (Lamy, 1910)	—	—	T.*	—
C. gaini (Lamy, 1910)	—	—	T.	—
*_C. signeyana_ n.sp.	—	T.	—	—
*_Neobuccinum eatoni_ (Smith, 1875)	*	M. & S.	*	—
*_Tromina tricarinata_ n.sp.	—	—	T.	—
*_Prosipho astrolabiensis_ (Strebel, 1908)	—	—	—	*
*_P. madigani_ Hedley, 1916	—	—	—	*
P. crassicostatus (Melvill & Standen, 1907)	—	T.	—	—
'_Mitra_ (_Volutomitra_) _porcellana_ Melvill & Standen, 1912' (probably a _Marginella_)	—	T.	—	—
*_Trophon echinolamellatus_ n.sp.	—	—	T.	—
T. minutus Melvill & Standen, 1907	—	T.	—	—
*_T. poirieria_ n.sp.	—	—	*	T.
*_T. shackletoni paucilamellatus_, n.subsp.	*	—	—	—
*_Harpovoluta charcoti_ (Lamy, 1910)	—	—	T*	—
*_Paradmete fragillima_ (Watson, 1882)	—	—	—	*
*_P. percarinata_ n.sp.	—	—	T.	—
*_Admete antarctica_ Strebel, 1908	—	—	*	—
*_Leucosyrinx paratenoceras_ n.sp.	—	—	T.	*
*_Aforia magnifica_ (Strebel, 1908)	*	—	*	*
*_Conorbela antarctica_ (Strebel, 1908)	—	—	*	—
*_Acteon antarcticus_ Thiele, 1912	—	—	*	—

	S. Sand.	S. Ork.	S. Shet.	Palm.
**Neactaeonina cingulata* (Strebel, 1908)	—	—	*	—
**N. edentula* (Watson, 1883)	—	—	*	—
**Toledonia major* (Hedley, 1911)	—	—	*	—
**Philine alata* Thiele, 1912	*	*	*	*
‘*Retusa*’ *antarctica* Melvill & Standen, 1912	—	T.	—	—
Cleodora sulcata (Pfeffer, 1879)	M.	—	—	—
Limacina helicina (Phipps, 1774)	M.	—	—	—
‘*L. costulata* Preston, 1916’	—	—	T.	—
L. balea (Moeller, 1841)	M.	—	—	—
Clione antarctica Smith, 1902	M.	—	—	—
Spongiobranchaea australis d’Orbigny, 1840	M.	—	—	—
Notaeolidia gigas Eliot, 1905	—	T.	—	—
N. purpurea Eliot, 1905	—	T.	—	—
Necromantes appendiculata (Eliot, 1905) *Tritonia*	—	T.	—	—
MPHINEURA				
Terenochiton kerguelenensis (Haddon, 1886) (=*pagenstecheri* Martens & Pfeffer, 1886)	—	M. & S.	—	—
Chaetopleura brucei (Iredale) Melvill & Standen, 1912	—	T.	—	—
Plaxiphora aurata (Spalowsky, 1795)	—	M. & S.	—	—
Hemiarthrum setulosum Dall, 1876	—	M. & S.	—	—
EPHALOPODA				
Cirroteuthis glacialis Robson, 1930	—	—	—	T
Graneledone turqueti Joubin, 1905	—	—	—	R.

BIPOLARITY

arly workers on the southern high-latitude molluscs noted the general similarity of the fauna to that f the Arctic, but as pointed out by Smith (1902 (*a*), p. 166): ‘It is a notorious fact that Mollusca from high titudes and from deep water are to a great extent devoid of bright colours. Even this prevailing dull opearance of the shells from the Arctic and Antarctic areas is almost enough to suggest an imaginary semblance.’

Subsequent workers have eliminated many molluscan claims to bipolar distribution either by demonrating from anatomical researches that quite different animals are concerned, or by revealing the resence of a more or less cosmopolitan distribution for species formerly thought to be restricted to gh latitudes. This is especially true in the Pteropoda. Nevertheless, a number of apparently genuine stances of bipolarity remain for consideration.

The term bipolarity has long been in use to indicate the presence of supposedly identical animals in e higher latitudes of both hemispheres and their apparent absence from intervening temperate and opical waters.

It has been noted that whereas certain stenothermic animals are present at moderate depths only in oth polar regions, they achieve continuity over the warm zones by descending to the cold waters of e ocean deeps. The distribution of the molluscan genus *Aforia* is a case in point.

Sverdrup, Johnson & Fleming (1942) define the three hypotheses that have been advanced to explain polarity. They are:

(1) ‘Bipolar animals are relics of a previous cosmopolitan fauna, the tropical portion of which is now tinct.’

(2) ‘Animals have migrated through cold deep water.’

(3) ‘Parallel development of the bipolar forms.’

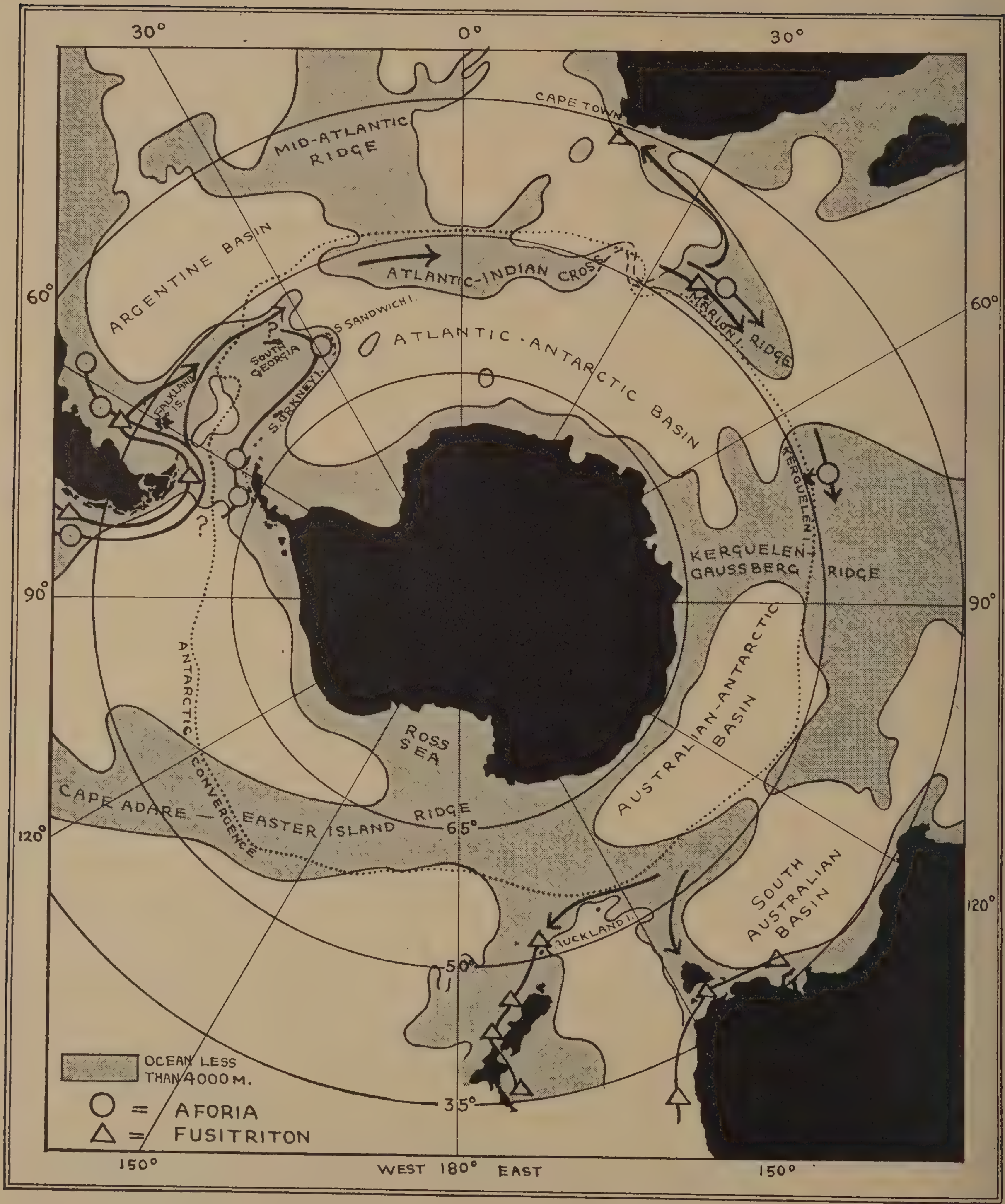

30°
0°
30°
MID-ATLANTIC RIDGE
CAPE TOWN
ARGENTINE BASIN
ATLANTIC-INDIAN CROSS
MARION I. RIDGE
60°
60°
S. SANDWICH I.
SOUTH GEORGIA
FALKLAND IS.
S. ORKNEY I.
ATLANTIC-ANTARCTIC BASIN
KERGUELEN I.
KERGUELEN-GAUSSBERG RIDGE
90°
90°
ANTARCTIC CONVERGENCE
ROSS SEA
AUSTRALIAN-ANTARCTIC BASIN
CAPE ADARE — EASTER ISLAND RIDGE
65°
120°
120°
SOUTH AUSTRALIAN BASIN
AUCKLAND I.
50°
35°
OCEAN LESS THAN 4000 M.
○ = AFORIA
△ = FUSITRITON
150°
WEST 180° EAST
150°

Fig. A. Southern Ocean (Polar Projection), showing distribution of *Aforia* and *Fusitriton*. Tinted areas less than 4000 m. deep. Map adapted from Deacon (1937) and Mackintosh (1946).

It would seem that hypotheses (1) and (2), which are basically the same, adequately explain this pparent phenomenon in general, and that (3) is scarcely justified, since present anomalies in distribuon probably result only from incomplete knowledge of past conditions. For instance, did the periods f glaciation in the Pleistocene bring the cold-water faunas of both hemispheres sufficiently close ogether to allow of a more efficient interchange of species than at present?

In Figs. A and B I have plotted the known ranges of the molluscan genera *Aforia*, *Fusitriton* and *canthina*. These genera occur both in northern and southern high latitudes; they are not cosmopolitan, et they have preserved a connected range that is obviously resultant from the continuity of the western oastline of the Americas plus their southern extension as the Scotia Arc. *Aforia* is stenothermic and as achieved continuity by going deep beneath the surface warm zones, but *Acanthina* is eurythermic nd maintains a connected distribution over the shallow warm zones. It is best developed in the central arm-water portion of its range, but has developed a cold-water tolerance also. *Fusitriton* is apparently

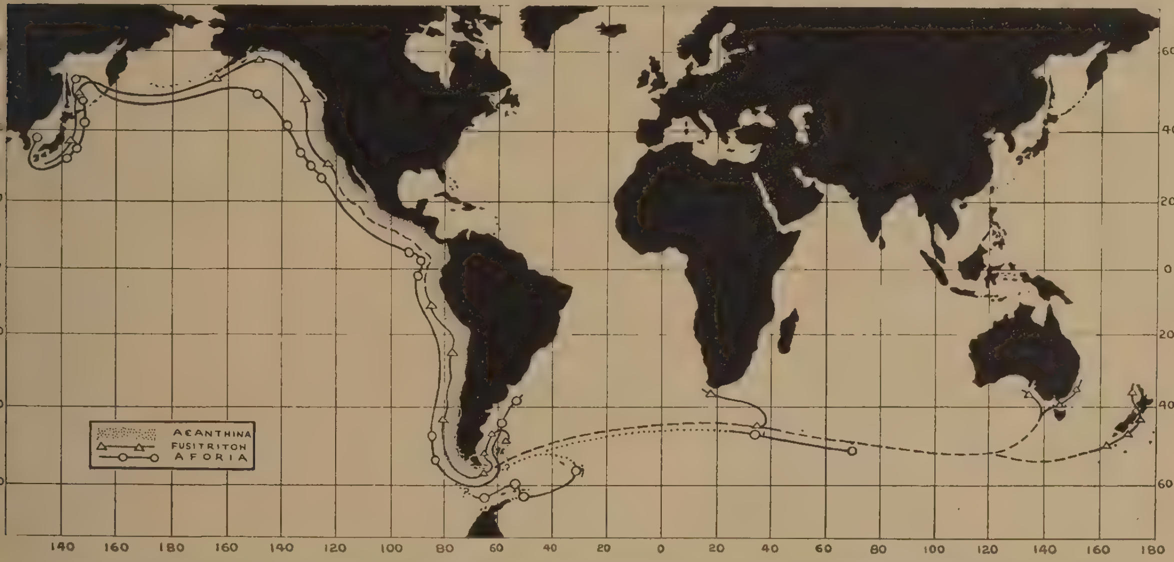


Fig. B. Distribution of *Acanthina* (shallow water) and *Fusitriton* and *Aforia* (continental shelf and deeper).

enothermic, with a considerable depth range, to as much as 1800 fathoms in one instance, but it is stricted for the most part to the continental shelves. Its almost complete continuity along the western oastline of the Americas is undoubtedly due in some measure to upwelling of cold currents such as e Peru coastal current.

The littoral southern molluscs of the genera *Kerguelenella* and *Pachysiphonaria* have their northern ounterpart in *Liriola*, but connecting forms are absent from warm seas, since these stenothermic nimals apparently have not adapted themselves to a benthic habitat. The question is, under what rmer conditions did they achieve a connected range?

Stephen (1941, p. 243), in his report on the *Echiuridae*, *Siphunculidae* and *Priapulidae*, lists twentyree Antarctic and Subantarctic species, of which ten are identical with and two close to Arctic ecies. A remark, applicable also to the molluscs, is that 'most of the bipolar species are confined to e South American Quadrant'.

The bulk of the Antarctic and Subantarctic molluscs are derivatives of a few cosmopolitan families: otably the *Patellidae*, *Fissurellidae*, *Trochidae*, *Littorinidae*, *Naticidae*, *Muricidae*, *Neptuniidae*, *Volutidae* nd *Turridae*.

The inference is that the present Antarctic fauna is of comparatively recent immigration, probably no earlier than Tertiary times, and that the continuity of the Americas is and has been the chief colonizing route.

Distribution of Aforia

Species and location	Depth in fathom	Temp. ° F.	Date
insignis (Jeffreys, 1883), 'Icy Sea', Siberia	—	—	—
okhotskensis Bartsch, 1945, Okhotsk Sea, 50–60° N	73	30·9	—
kincaidi (Dall, 1920), Shelikoff Strait, Alaska	—	—	—
sakhalinensis Bartsch, 1945, off Sakhalin I.	399	38·1	—
diomedea Bartsch, 1945, Hokkaido, Japan	266–399	32·1–38·1	—
chosenensis Bartsch, 1945, Japan Sea, 40° N	122	34·1	—
japonica (Dall, 1925), Honshu, Japan, 35° N	369	41·8	—
hondoana (Dall, 1925), Hondo, Japan	614	37·5	—
crebristriata (Dall, 1908), south-west of Sitka, Alaska	1569	34·9	—
persimilis leonis (Dall, 1908), Washington	877	36·6	—
persimilis blanca (Dall, 1919), Cape Blanco, Oregon	1064	35·9	—
amycus (Dall, 1920), off Monterey, California	871	38	—
persimilis (Dall, 1889), Cortez Bank, California	984	38	—
Gulf of Panama	1020	36·8	10 Mar. 1891
off Panama	1067	37	27 Feb. 1891
off Ecuador, 1° 03′ N	741	38·4	—
south-west coast of Chile	677	38	—
goodei (Dall, 1889), north-west Patagonia, 45° 35′ S	1050	36·9	—
goniodes (Watson, 1881), south-east of Rio de Plata, Argentina	600	37·2	14 Feb. 1876
between Falklands and Patagonia	82	—	30 Mar. 1932
staminea (Watson, 1881), off Marion and Prince Edward Is.	1375	35·6	29 Dec. 1873
Kerguelen I.	105	—	—
magnifica (Strebel, 1908), south-west of Snow Hill I. 64° S	82	—	—
Palmer Archipelago	152–273	32·38	14 Mar. 1927
South Shetlands	214	32·07	11 Jan. 1937
South Sandwich Is.	180	32·7	26 Feb. 1930

The temperatures cited are associated with specimens dredged at various seasons of the year, nevertheless the lowest temperature record, 30·9° F., and the highest, 41·8° F., show a surprisingly small range, with a maximum difference of only 10·9°. That these stenothermic animals go deep over the tropics in order to keep within their temperature requirements is clearly shown by the *persimilis* records, especially that of the Ecuador occurrence, which at a depth of 741 fathoms and a temperature of 38·4° F. is situated only 1° 03′ N of the equator.

BIOGEOGRAPHICAL PROVINCES

It is not desirable at this stage of our knowledge of southern high-latitude molluscs to formulate a comprehensive scheme of biogeographical provinces.

A set of quadrant names proposed by Markham (1912) for the Antarctic and by Waite (1916) for the Subantarctic extensions of these quadrants may be usefully employed for indicating positions and in recording distribution.

The Antarctic quadrants named by Markham were:

The Victoria Quadrant:	90° to 180° E
The Ross Quadrant:	180° to 90° W
The Weddell Quadrant:	90° to 0° W
The Enderby Quadrant:	0° to 90° E.

The Subantarctic extended quadrants proposed by Waite were:

Australian Zonal Quadrant: An extension of Victoria Quadrant.
Pacific Zonal Quadrant: An extension of Ross Quadrant.
American Zonal Quadrant: An extension of Weddell Quadrant.
African Zonal Quadrant: An extension of Enderby Quadrant.

To these arbitrarily defined areas Waite proposed the following faunal districts:

A. Antipodes District. Subantarctic Islands of New Zealand, including Macquarie Island, Stewart land, and southern Otago of the South Island of New Zealand.

M. Magellan District.

K. Kerguelen District. Includes Marion Island, Crozets, Heard Island and Kerguelen.

G. Glacial District. The whole of the Antarctic within the Antarctic Convergence.

Finlay (1926, p. 328) proposed five New Zealand faunal provinces, the last two of which, the orsterian for South and Stewart Islands, New Zealand, and the Rossian for the Subantarctic Islands New Zealand including Macquarie Island, are relevant to this discussion.

The name Rossian is an unfortunate choice, since it precludes a more appropriate use of this name r the Ross Sea area. In any case I recommend the substitution of Antipodean for Finlay's Rossian, nce Waite's earlier propositions were overlooked by Finlay. I also advocate the use of Waite's agellan and Kerguelen Districts, but consider his fourth one, the Glacial, pointless, since it merely bstitutes a term for the restricted Antarctic circumpolar area which will later require subdivision on faunal basis.

At the present stage I nominate only one addition to the biogeographic areas already outlined, that is, e Georgian for the South Georgia-Shag Rocks area.

Mackintosh (1946, pp. 177–212) gave a detailed account of the Antarctic Convergence with charts. he plotting of the mean position of the Convergence places South Georgia within the Antarctic Zone, acquarie Island in the Subantarctic Zone, Kerguelen Island right on the convergence, with Heard land below, and Marion Island-Crozets above it.

The following named southern high-latitude provinces are recommended for the present:

(1) *Magellan.* Patagonia from below Chiloe Island (west coast) and Cape Blanco (east coast) (Regan, 24, p. 26), Tierra del Fuego, East Patagonian Continental Shelf including the Falkland Islands and e Burdwood Bank.

(2) *Georgian.* South Georgia and Shag Rocks.

(3) *Kerguelenian.* Kerguelen Island plus Heard Island, the Crozets, Marion and Prince Edward lands. Possibly Bouvet Island.

(4) *Antipodean* (=Rossian). Subantarctic Islands of New Zealand including Macquarie Island.

DISTRIBUTION OF SOUTHERN HIGH-LATITUDE MOLLUSCA

he bulk of the Antarctic and Subantarctic molluscs are derivatives of a few cosmopolitan families, otably the Patellidae, Trochidae, Naticidae, Muricidae, Neptuniidae, Volutidae and Turridae.

amily PATELLIDAE

The limpets belong to two characteristic Magellanic genera, *Patinigera* and *Nacella.* The former nges from the Magellan Province to Graham Land and eastwards to Kerguelen Island, Macquarie land and the Subantarctic Islands of New Zealand. True *Nacella* is recorded from the Magellan ovince and Kerguelen, but does not seem to occur elsewhere. *Nacella* and *Patinigera*, to some extent, e attached to the giant kelp *D'Urvillea*, and this habit is the main cause, aided by the West Wind rift, of their eastern extended range.

These genera are stenothermic, for in the New Zealand Subantarctic groups, Campbell and Aucklan Islands, the common limpets are of the subtropical genus *Cellana* which occurs to the entire exclusio of *Patinigera* over the rest of the New Zealand area to the north.

Family Fissurellidae

The large Fissurellid subgenus *Balboaina* is restricted to the Magellan Province. The specie *Puncturella conica*, which is found in most southern high latitudes, is distinguished only with difficult from the boreal genotype. It is a good example of a 'bipolar' genus which ranges deep over the war zones. The route of migration to the south or vice versa could be either the eastern or western America coastlines, or both. *Parmaphorella* occurs in the Magellan Province and extends via the Atlantic Indian Ocean cross-ridge to South Africa. The related genus *Tugalia* is found in warm water in th East Indian-Australian-New Zealand regions.

Family Trochidae

The Trochoids form a conspicuous element in the Antarctic-Subantarctic region (see Fig. C).

A. *Calliostoma* group. True *Calliostoma* does not extend farther south than the Magellan Province but the following genera are specialized Antarctic-Subantarctic derivatives of *Calliostoma*:

(1) *Photinula*. Magellan, 0–202 m.

(2) *Photinastoma*. Magellan, 0–115 m.

(3) *Venustatrochus* n.g. South Georgia only, 120–204 m.

(4) *Falsimargarita* n.g. Falkland Islands, South Shetland Islands and off Oates Land, 69° 43′ S 163° 24′ E, 250–468 m.

B. *Margarella* group. This is a wide-ranging, high-latitude southern genus related to the borea *Margarita*. Many of its members are directly herbivorous, and its circum-subantarctic range no doub has been assisted by the direct agency of the West Wind Drift. The genus is common in the Magella Province, South Georgia to Graham Land, eastward along the Antarctic Continental Shelf to the Ros Sea and via the Atlantic-Indian Ocean cross-ridge to Marion Island, the Crozets, Kerguelen, Macquari Island, the subantarctic islands of New Zealand, and the southern and eastern coastline of the Sout Island of New Zealand to about 42° S. The New Zealand members are littoral species mostly restricte to the holdfasts of the giant kelp *D'Urvillea*.

The subgenus *Promargarita* is restricted to South Georgia, and the somewhat related *Submargarit* ranges from South Georgia to Kerguelen and the Davis Sea.

Other *Margarita*-like genera are the elaborately sculptured *Antimargarita* n.g., circum-antarctic i deep water (130–400 fathoms) and *Tropidomarga* n.g., South Georgia and Clarence Island, 160–342 m

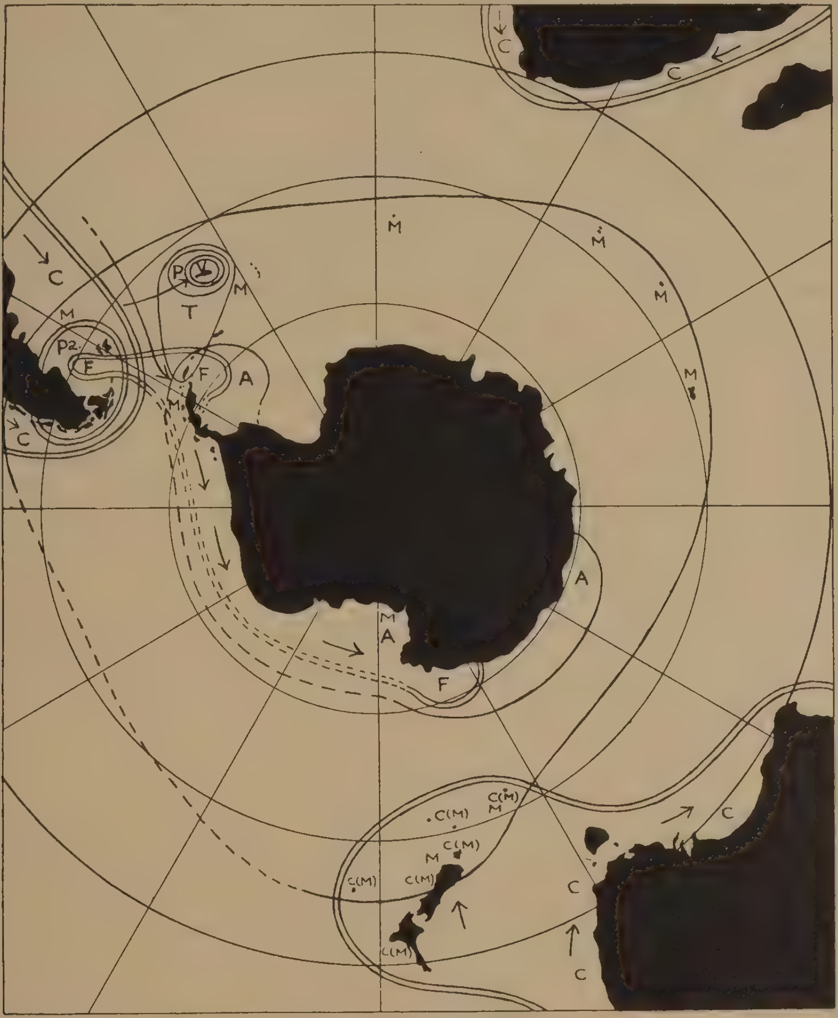
Solariella occurs in deep water from the Falklands to Heard Island and Kerguelen. The genotype i from the English Pliocene, but the genus is well represented in north-west America, the North Atlanti and the Indian Ocean.

From the above it can be assumed that this considerable southern high-latitude radiation of Trochoid originated from the American Quadrant.

Family Littorinidae

The periwinkles are represented by the wide-ranging, mainly subantarctic genus *Laevilitorina* several specialized genera from the higher latitudes of the Scotia Arc, and *Pellilitorina*, which has bee recorded from the Burdwood Bank, South Georgia, South Orkneys, South Shetlands, Bouvet Island Kerguelen and Cape Adare (Antarctica). A South Australian species, *globula* Angas, 1880, has bee referred to *Pellilitorina*, which it certainly resembles, but this claim requires confirmation.

True *Laevilitorina* ranges from Patagonia to the subantarctic islands of New Zealand, but is replaced n the New Zealand mainland by *Zelaxitas*. Here again the Australian '*Laevilitorina*' *mariae* Tennyson Voods, 1876, requires investigation. The distribution of the Laevilitorinids is again suggestive of an astern subantarctic drift from the American Quadrant.



ig. C. Distribution of Antarctic and Subantarctic Trochoids. Calliostomatinae bounded by double lines, Stomatellinae by a single line. *A* = *Antimargarita*. *C* = *Calliostoma*. *C* (*M*) = *Calliostoma* (*Venustas*). *F* = *Falsimargarita*. *M* = *Margarella*. *P* = *Promargarita*. *P*2 = *Photinula* and *Photinastoma*. *T* = *Tropidomarga*. *V* = *Venustatrochus*.

amily NATICIDAE

If I am correct in assigning most of the southern high-latitude Naticoids to the boreal genus *mauropsis*, there is no doubt that the continuity of the west coast of the Americas indicates the former oute. Of the remaining Naticoid genera, *Falsilunatia* has most in common with northern *Lunatia*, *ectonatica* is a Mediterranean Pliocene genus, *Sinuber* ranges from the Falkland Islands and South eorgia to the South Shetland Islands and eastwards to Kerguelen and the Ross Sea, and *Prolacuna* is pparently restricted to deep water of Antarctic occurrence, extending from the Davis Sea to the Ross ea. The American route is again indicated.

Family TRICHOTROPIDAE

There are four endemic southern high-latitude genera in this family, clearly related to the boreal genera, *Trichotropis* and *Torellia*. The range of the four southern genera is:

(1) *Antitrichotropis*: Antarctic, Palmer Archipelago to Ross Sea.
(2) *Trichoconcha*: Antarctic, South Georgia to Ross Sea.
(3) *Neoconcha*: Ross Sea.
(4) *Discotrichoconcha*: Palmer Archipelago.

Familes CREPIDULIDAE and CALYPTRAEIDAE

The genus *Crepipatella* is of West American origin, *dilatata* occurring from the west coast of South America and the Magellan Province, and *lingulata* from the Bering Sea to Panama.

The genus *Trochita* is West American also, ranging from Panama to the Magellan Province and occurring also at South Georgia. The simplification of the septum in the South Georgian species suggests that it and the New Zealand *Zegalerus* may have had a common origin in the south.

Family STRUTHIOLARIIDAE

In the systematic section I suggest that the only living southern high-latitude Struthiolarid genus, *Perissodonta*, is identical with a South American Oligocene group (*Struthiolarella*). The known range of the Struthiolariidae is: Patagonia (Oligocene), South Georgia and Kerguelen Island (Recent) *Perissodonta*; New Zealand, *Conchothyra* (Upper Cretaceous), *Perissodonta* (*Struthiolarella minor* (Marshall, 1917)) (Danian, Upper Cretaceous), *Monalaria* (Lower Tertiary), *Callusaria* (Middle and Upper Tertiary), *Struthiolaria* (Middle Tertiary to Recent), *Pelicaria* (Upper Tertiary to Recent) Southern Australia, *Tylospira*, Upper Tertiary to Recent.

The family seems to have had its origin in the Jurassic to Recent Aporrhaidae, which are of northern hemisphere origin, to have spread down the Americas to Patagonia and finally reached South Georgia, Kerguelen, New Zealand and Australia by shallow-water extensions from Antarctica. The present discontinuous distribution of Struthiolarids is evidently the result of extinctions over much of the probable former range of the family.

Family CYMATIIDAE

The genus *Fusitriton* has been referred to in the previous section on 'Bipolarity' and is dealt with more fully in the systematic section. Its range is from Japan via the Aleutian Chain, the western coast of the Americas, Falkland Islands, South Africa, Marion Island via the Atlantic-Indian Ocean cross-ridge, New Zealand and southern to eastern Australia.

Family BUCCINULIDAE

The southern whelks are apparently related to the northern Neptuniidae rather than to the northern Buccinidae. There is a considerable radiation of southern generic groups, even more so than in the Trochidae. The distribution of these genera is as follows:

(1) *Pareuthria*. Magellan, Davis Sea and Campbell Island, New Zealand Subantarctic.
(2) *Tromina*. Magellan, and Clarence Island, South Shetlands.
(3) *Notoficula*. Bouvet Island and Falkland Islands. Atlantic-Indian Ocean cross-ridge.
(4) *Falsimohnia* n.g. South Georgia and Kerguelen Island.
(5) *Glypteuthria*. Magellan and South Africa. Atlantic-Indian Ocean cross-ridge.
(6) *Chlanidota*. South Shetlands, South Orkneys, South Georgia, Bouvet Island, Kerguelen Island and Cape Adare.
(7) *Pfefferia*. South Georgia.
(8) *Neobuccinum*. Graham Land to Ross Sea and Kerguelen Island.

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(9) *Probuccinum*. South Georgia to Ross Sea, Kerguelen Island and Macquarie Island. North-west Patagonia?

(10) *Cavineptunea* n.g. South Georgia and Shag Rocks.

(11) *Prosipho*. Graham Land to Ross Sea; South Georgia to Kerguelen Island and Macquarie Island.

(12) *Anomacme*. Magellan.

(13) *Meteuthria*. Magellan to Heard and Kerguelen Islands.

(14) *Proneptunea*. Kerguelen Island, South Georgia and Shag Rocks.

(15) *Chlanidotella*. South Georgia.

Family MURICIDAE

The family is represented by numerous Trophons, the West American genus *Acanthina* in the Magellan Province and the Falkland *Typhina belcheri*, probably of warm-water African origin. Typical *Trophon* ranges from the Magellan Province over the whole circumference of the Antarctic Continental Shelf via the Scotia Arc, as well as to Kerguelen and Macquarie Islands. The new genus *Xymenopsis* and the new subgenera *Fuegotrophon* and *Stramonitrophon* are restricted to the Magellan Province.

The *Trophons* are of world-wide distribution, but the southern typical members are most like northern *Boreotrophon*, again suggesting West American continuity, since the North Pacific is the stronghold of he latter genus.

Family VOLUTIDAE

The large heavy Volutes, *Adelomelon*, are South American and Magellanic. The Magellanic Tertiary-o-Recent *Miomelon* and the New Zealand Tertiary-to-Recent *Pachymelon-Palomelon* evidently had a common ancestry, yet no volutes of this style are known from intermediate areas.

The other high-latitude southern volutes belong to several specialized genera:

(1) *Harpovoluta*: A small thin-shelled Volute resembling the Buccinid *Volutharpa*. Distribution: South Shetlands, Davis Sea and Macquarie Island (Tomlin, 1948).

(2) *Provocator*: A small, elongated, thin-shelled Volute from Kerguelen Island and between Falkland Islands and Patagonia.

(3) *Guivillea*: A large, thin-shelled Volute from Marion Island to the Crozets.

(4) *Paradmete*: Small, solid, *Mitra*-like shells closely allied to the boreal genus *Volutomitra*. Distribution: Kerguelen Island, off Tierra del Fuego, South Georgia, South Shetlands and Palmer Archipelago.

Family TURRIDAE

The Turrids are represented by a number of regional genera of uncertain affinity with those from northern seas. The '*Bela*' complex covers several new genera and others that for the present have been eft in this conventional location.

The large attractive *Aforia* is a splendid example of 'bipolar' distribution and has been dealt with in he previous section. Another member of the Cochlespirinae, *Leucosyrinx*, probably has a connected range up the eastern South American coast in deep water to the West Indies, where similar species to those from the Falklands-Scotia Arc localities are well represented.

A new genus of the Daphnelliinae, *Typhlodaphne*, from Magellan and South Georgia to Kerguelen, closely resembles *Typhlosyrinx* from deep water in the Gulf of Aden.

Family ACTEONIDAE

The type genus *Acteon*, represented by magellanic and antarctic species, is cosmopolitan, but *Neactaeonina* is restricted to the Antarctic, ranging from South Georgia to the South Shetlands and eastwards to Kreguelen Island and the Ross Sea. Another subantarctic-antarctic genus, *Toledonia*, ranges from the Falkland Islands to the South Shetlands and eastwards to Kerguelen and the Ross Sea.

Family PHILINIDAE

The cosmopolitan genus *Philine* is represented by four species: *kerguelensis* extends via the Atlantic-Indian Ocean cross-ridge from Kerguelen Island to north of the Falklands, *alata* from the Palmer Archipelago to the Davis Sea, *gibba* appears to be restricted to South Georgia and *falklandica* to the vicinity of the Falklands.

Family SCAPHANDRIDAE

If my reference of a new South Georgian species to *Kaitoa* is correct, then this link with a Miocene New Zealand genus is of interest.

Family SIPHONARIIDAE

The characteristic subantarctic genus *Kerguelenella* ranges from the Magellan Province to South Georgia and eastwards to Kerguelen, the Macquarie Islands, and the subantarctic islands and Stewart Island of New Zealand. The genus shows relationship with the North Pacific boreal *Liriola*, but connecting links are no longer apparent.

SUMMARY

The above discussion shows that it is reasonable to suppose that the bulk of the southern high-latitude molluscan fauna could have been derived from the Americas, particularly the western coastline, which links more than two-thirds of the structural margin of the Pacific. Southern and eastern dispersal has been assisted by the continuity of the Americas in the Scotia Arc, which reaches the Antarctic Continent at Graham Land and in the Atlantic-Indian Ocean cross-ridge, which runs from the Argentine Basin almost to the Kerguelen-Gaussberg (radial) ridge. Possibly other radial extensions from Antarctica in former times may have operated also in distributing southern fauna to the Australian and New Zealand areas. The subantarctic cross-ridges may also have been much shallower during some former period than at the present time and thus more effective in distributing organisms more or less restricted to the Continental Shelf.

The prevailing West Wind Drift north of the Antarctic Circle and the opposite East Wind Drift to its south are present factors which must greatly facilitate the lateral distribution of many species.

With the exception of the Struthiolariidae, which have an ancestry extending back to the Cretaceous, the present southern high-latitude molluscan fauna presents no indication of antiquity. The bulk of the fauna probably results from a series of comparatively recent immigrations during Tertiary to Pleistocene times. There is a marked absence of archaic types such as *Pleurotomaria*.

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(New species*, new genera †)

The report covers 215 species and includes descriptions of a new subfamily, the Solariellinae, 26 new genera and subgenera, and 46 new species and subspecies.

The material, including the types, will be deposited in the British Museum (Natural History).

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The present work would have been impossible of accomplishment by one situated so far away from the libraries and collections associated with the larger and older scientific centres, but for the fortunate chance that the R.R.S. 'Discovery II' refitted in Auckland, New Zealand, during August 1932. Through the kindness of the late Commander W. M. Carey and the scientific staff under Mr Dilwyn John, I was allowed the privilege of referring to the extensive library of Antarctic reports in the ship's laboratory. During the six weeks of the vessel's stay in Auckland I worked constantly, typing relevant sections of text and photographing plates.

A subsequent visit to Sydney in 1937 enabled the completion of references by working on the extensive collection of separates accumulated by the late Mr Charles Hedley for his researches on the British Antarctic Expedition 1907–9 and the Australian Antarctic Expedition molluscan collections.

At the Australian Museum, Sydney, I examined their considerable collection of Antarctic Mollusca, and later received on loan from Dr Nils H. Odhner of Stockholm a representative series from the collections made by the Swedish South Polar Expedition.

My private collection of Mollusca, now deposited in the Auckland Museum, contains much southern material, and this has proved useful for comparative purposes.

For many requests for other comparative material I have to thank Mr J. R. le B. Tomlin of Sussex.

To all members of the Discovery Committee who have helped with this work, and to those specifically referred to above, I am most grateful.

SYSTEMATIC

PELECYPODA

Family NUCULANIDAE

Genus **Propeleda** Iredale, 1924

Type (o.d.): *Leda ensicula* Angas

Propeleda longicaudata

Leda longicaudata Thiele, 1912, p. 229, pl. 17, fig. 22.
Poroleda longicaudata Hedley, 1916, p. 18.
Propeleda longicaudata Iredale, 1924, p. 186.

TYPE LOCALITY. Gauss Station, Davis Sea, Antarctica.

St. 600. West of Adelaide I., Bellingshausen Sea, 67° 09′ S, 69° 27′ W., 17 Jan. 1931, 487–512 m. (one living example).

Length 16 mm.; height 6 mm. (holotype).
Length 21 mm.; height 6 mm. (Hedley, St. X, Davis Sea).
Length 26 mm.; height 10·25 mm. (St. 600).

As already noted by Hedley (1916), large examples tend to become proportionately narrower than small ones, e.g. the holotype. The rostrum tends to lengthen disproportionately to the rest of the shell.

Family LIMOPSIDAE

Genus **Limopsis** Sassi, 1827

Type (s.d. Gray, 1847): *Arca aurita* Brocchi, Miocene and Pliocene of Italy

Limopsis hirtella Rochebrune & Mabille.

Limopsis hirtella Rochebrune & Mabille, 1889, p. 115.
Limopsis hirtella Lamy, 1911 *a*, p. 25, pl. 1, figs. 18, 19, 20.

TYPE LOCALITY. Orange Bay, Patagonia.

St. WS 773. North of Falkland Is., 47° 28′ S, 60° 51′ W, 31 Oct. 1931, 291 m. (one valve, length 9·75 mm., height 9 mm., thickness 3 mm.).

RANGE. Patagonia (Rochebrune & Mabille); north of Falkland Is.; Petermann I. (Lamy).

Subgenus **Felicia** Rochebrune & Mabille, 1889

Type (monotypy): *Felicia jousseaumi* Rochebrune & Mabille

Limopsis (Felicia) jousseaumi (Rochebrune & Mabille).

Felicia jousseaumi Rochebrune & Mabille, 1889, p. 116, pl. 7, fig. 9*a*, *b*.
Limopsis jousseaumi Dall, 1908, p. 394.
Limopsis jousseaumei Lamy, 1911 *a*, p. 26.
Limopsis jousseaumei Thiele, 1912, p. 228.

TYPE LOCALITY. Beagle Channel, Tierra del Fuego.

St. 600. West of Adelaide I., Bellingshausen sea, 67° 09′ S, 69° 27′ W, 17 Jan. 1931, 487–512 m. (one living example, 34 × 28 × 11 mm., exclusive of periostracum).

RANGE. Beagle Channel, Tierra del Fuego (type); off Alexander Land, 297 m. (Lamy, 1911); off southern coast of Chile, 53° 1′ S in 369 fathoms (Dall, 1908).

Lamy (1911 *a*, p. 27) synonymized *Limopsis grandis* Smith (1907 *b*), with *jousseaumi*, but Thiele (1912) maintained them as distinct and figured the hinge characters of both. Dall (1908) did not recognize *Felicia*, as the 'absence of a fossette', upon which supposed character the genus was founded, was shown to be a misconception. However, these Antarctic, large, thin-shelled, deep-water Limopsids would seem to be worth separating subgenerically on account of the relatively small, weakly developed hinge and tiny fossette. Related species are: *grandis* Smith (1907 *b*), from Davis Sea, 254 fathoms; *marionensis* Smith, 1885 from off Marion Island in 140 fathoms; *laeviuscula* Pelseneer, 1903 from 71° S, 89° W; and *longipilosa* Pelseneer (1903), from 71° 22′ S, 16° 34′ W in 1410 fathoms.

Genus **Lissarca** Smith, 1877

Type (monotypy): *Arca* (*Lissarca*) *rubrofusca* Smith

Lissarca cf. **notorcadensis** Melvill & Standen

Lissarca notorcadensis Melvill & Standen, 1907, p. 144, figs. 14, 14*a*.
Arca (*Bathyarca*) *gourdoni* Lamy, 1911 *a*, p. 28, pl. 1, figs. 21, 22.
Lissarca gourdoni Thiele, 1912, p. 228, pl. 18, fig. 3.
Lissarca notorcadensis Smith, 1915, p. 75.
Lissarca notorcadensis Hedley, 1916, p. 19.

TYPE LOCALITIES. Scotia Bay, South Orkneys, 9–15 fathoms (*notorcadensis*); Alexander I., 250 m., Bellingshausen Sea (*gourdoni*).

St. WS 838. Between Patagonia and Falkland Is., 53° 11′ 45″ S, 65° W, 5 Feb. 1932, 148 m. (one living example).

RANGE. Alexander I. (Lamy); South Orkneys (Melvill & Standen); Gauss Station (Thiele); Commonwealth Bay, Adelie Land, 25–400 fathoms (Hedley); Ross Sea, 140–160 fathoms (Smith).

The reference of the St. WS 838 specimen to the above species is not certain, for the single example is not adult.

Family PANDORIDAE

Genus **Pandora** Lamarck, 1799

Subgenus **Kennerlia** Carpenter, 1864

Type (s.d. Dall, 1903): *K. filosa* Carpenter. Recent, North-west America

Pandora (Kennerlia) braziliensis Sowerby

Pandora braziliensis Sowerby, 1874*b*, pl. 2, fig. 15.
Pandora (*Kennerlia*) *braziliensis* Smith, 1881, p. 40, pl. 5, fig. 4*a–c*.

St. WS 854. Off Cape Dos Bahias, Patagonia, 22 Mar. 1932, 97–97 m.

The species has been recorded previously from the Magellan Province by Smith (1881), i.e. Port Rosario, 2–30 fathoms.

Family HIATELLIDAE

Genus **Hiatella** Daudin, 1801

Hiatella antarctica (Philippi)

Saxicava antarctica Philippi, 1845, p. 51.
Saxicava sp. (cf.) *antarctica* Smith, 1881, p. 40.
Saxicava antarctica Rochebrune & Mabille, 1889, p. H. 102.
Saxicava arctica var. *antarctica* Melvill & Standen, 1907, p. 121.
Saxicava antarctica Thiele, 1912, p. 256.
Saxicava antarctica Hedley, 1916, p. 33.

Type locality. Strait of Magellan.

St. WS 228. North-east of Falkland Is., 50° 50′ S, 56° 58′ W, 30 June 1928, 229 m., 227–236 m.
St. WS 834. Below eastern entrance to the Strait of Magellan, 2 Feb. 1932, 27–28 m.
St. WS 836. Off Patagonia, 53° 05′ 30″ S, 67° 38′ W, 3 Feb. 1932, 64 m.

Range. Patagonia (Philippi, 1845; Rochebrune & Mabille, 1889); Gough I., 100 fathoms and Burdwood Bank, 56 fathoms (Melvill & Standen, 1907); Kerguelen I. (Thiele, 1912); Macquarie I. (Hedley, 1916).

Shells of the nestling habit are so variable in shape that it is almost impossible to select characters of any taxonomic importance. It seems reasonable to suppose that there is only one wide-ranging southern species. The following nominal species have been described from Antarctic and Subantarctic Seas: *antarctica* Philippi, 1845, Strait of Magellan; *bisulcata* Smith, 1879, Kerguelen Island; *chilensis* Hupé (Gay), Calbuco, Chile; *frigida*, *lebruni* and *mollis* Rochebrune & Mabille, 1889, Orange Bay, Patagonia; and *subantarctica* Preston, 1913, Falkland Islands.

GASTROPODA

Family SCISSURELLIDAE

Genus **Schizotrochus** Monterosato, 1877

Type: *Scissurella crispata* Fleming

Schizotrochus euglyptus (Pelseneer)

Scissurella euglypta Pelseneer, 1903, p. 17, pl. 4, figs. 43–45.
Scissurella euglypta Thiele, 1912, p. 187.
Scissurella euglypta Melvill & Standen, 1912, p. 345.

Type locality. *Circa* 70° S, 83–87° W.

St. 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W, to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m.
St. 190. Bismarck Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 24 Mar. 1927, 93–130 m. (one broken specimen).

Range. Recorded also from Gauss Station, Davis Sea (Thiele, 1912) and Burdwood Bank, 56 fathoms, south of Falkland Is. (Melvill & Standen, 1912).

Family PATELLOIDIDAE

Genus **Patelloida** Quoy & Gaimard, 1834

Type (s.d. Gray 1847): *Acmaea rugosa* Quoy & Gaimard = *Acmaea* Eschscholtz, 1833
non *Acmea* Hartmann, 1821 (see Winckworth, 1934)

Patelloida ceciliana (Orbigny)

Patella ceciliana Orbigny, 1841, p. 482, pl. 81, figs. 4–6.
Patella ceciliana (Gay) Hupé, 1854, p. 260.
Acmaea ceciliana Tryon & Pilsbry, 1891, p. 33, pl. 34, figs. 14–21.
Acmaea ceciliana Melvill & Standen, 1907, p. 126.

Type locality. Falkland Is.?

St. 51. Off Eddystone Rock, east of Falkland Is. from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock 4 May 1926, 105–115 m. (one dead shell). Falkland Islands (A.W.B.P. coll. Auck. Mus.).

Range. Antofagasta to Valparaiso, Chile (Dall, 1909); Falkland Is. (Melvill & Standen, 1898, 1901 1907).

Strebel (1907) described a subspecies *magellanica* from Tierra del Fuego.

Family PATELLIDAE

Genus **Nacella** Schumacher, 1817

Type (s.d. Gray, 1847): *Patella mytilina* Helbling

The genus is here restricted to the thin, ovate shells with anterior apex. The thicker shelled southern limpets with a bronze iridescence and subcentral apex, usually included in *Nacella*, are here segregated into *Patinigera*. True *Nacella* lives upon the giant seaweeds, *D'Urvillea* and *Macrocystis*.

Nacella mytilina (Helbling)

Patella mytilina Helbling, 1779, p. 104, pl. 1, figs. 5, 6.
Patella mytilina Gmelin, 1791, p. 3698.
Patella conchacea Gmelin, 1791, p. 3708.
Nacella mytiloides Schumacher, 1817, p. 179.
Nacella mytilina Dall, 1870, p. 274.
Nacella compressa Rochebrune & Mabille, 1889, p. 98, pl. 5, fig. 9.
Nacella mytilina Pilsbry, 1891, p. 115, pl. 50, figs. 32–39.
Nacella mytilina Smith, 1905, p. 336.
Patella mytilina Strebel, 1907, p. 113, pl. 3, fig. 44; pl. 4, figs. 49, 51–55, 57, 57*a*, 59.
Nacella mytilina Thiele, 1912, p. 234.
Nacella falklandica Preston, ?1913, p. 221, pl. 4, fig. 6.
Nacella mytilina Melvill & Standen, 1914, p. 114.

The following are probable synonyms also: *Patella cymbularia* Lamarck (1819), Strait of Magellan *P. hyalina* Philippi (1845) (maintained as distinct by Melvill & Standen, 1914); and *P. vitrea* Philipp (1845) (maintained as distinct by Strebel, 1907). Preston's *Nacella falklandica* appears to be an individual variant of *mytilina* with strong radials. I have typical examples of *mytilina* from Port Stanley Falkland Islands, collected by Mr A. G. Bennett.

Type locality. Strait of Magellan.

St. 222. St Martin's Cove, Hermite Island, Cape Horn, 24 April. 1927, on *Macrocystis*.

RANGE. Strait of Magellan; Tierra del Fuego (Smith, 1905); Falkland Is. (Strebel, 1907; Melvill & Standen, 1914; A. G. Bennett, loc. cit.); Kerguelen I. (Thiele, 1912).

Length 27·00 mm.; breadth 18·0 mm.; height 7·5 mm. (St. 222).
Length 35·75 mm.; breadth 22·5 mm.; height 11·0 mm. (Falkland Islands).
Length 41·00 mm.; breadth 24·0 mm.; height 17·0 mm. (Pilsbry, 1891).

Genus Patinigera Dall, 1905

n.nom. for *Patinella* Dall, 1871 *non* Gray, 1848
Type (o.d.) *Patella magellanica* Gmelin

This genus and *Nacella* have the gill cordon continuous and the foot encircled by a scalloped epipodial ridge, which is interrupted in front by the head. They both differ in these respects from *Cellana*, which has an incomplete branchial cordon and no epipodial ridge.

The shell in *Patinigera* has a subcentral apex and is of normal shape and solidity, as in *Patella* and *Cellana*, but is at once distinguished by the bronzy lustre of the nacreous interior.

The range of *Patinigera* covers most of the Antarctic and Subantarctic, but *Nacella* seems to be restricted to the Subantarctic from the Magellan region to Kerguelen Island.

The valid species and subspecies of *Patinigera* appear to be as follows: *clypeata* (Lesson, 1830), Valparaiso, Chile; *magellanica* (Gmelin, 1791), Strait of Magellan, Tierra del Fuego and southern Patagonia; *magellanica venosa* (Reeve, 1854) (=*chiloensis* Reeve, 1855), Island of Chiloe, Chile; *uegiensis* (Reeve, 1855), Subantarctic, Tierra del Fuego to Kerguelen Island; *aenea* (Martyn, 1784) =*deaurata* Gmelin, 1791), Straits of Magellan, eastern Tierra del Fuego and Falkland Islands; *polaris* Hombron & Jacquinot, 1841), Antarctic, South Georgia and Seymour Island to Bouvet Island; *polaris concinna* (Strebel, 1908), South Georgia; *kerguelenensis* (Smith, 1879), Kerguelen Island and Macquarie Island?; *macquariensis* (Finlay, 1926), Macquarie Island; and *terroris* (Filhol, 1880), Campbell Island.

I have not seen *fuegiensis* (Reeve, 1855), a seaweed-frequenting species, or *delesserti* (Philippi, 1849), Marion Island, probably distinct, or *depsta* (Reeve, 1855, Island of St Paul) which may be a *Cellana*.

Patinigera magellanica Gmelin

Patella magellanica Gmelin, 1791, p. 3703.
Patella atramentosa Reeve, 1854, fig. 41.
Patella magellanica Reeve, 1854, fig. 19.
Patella meridionalis Rochebrune & Mabille, 1885, p. 109.
Patella tincta Rochebrune & Mabille, 1885, p. 110.
Patella pupillata Rochebrune & Mabille, 1885, p. 120.
Patella metallica Rochebrune & Mabille, 1885, p. 109.
Nacella aenea magellanica Pilsbry, 1891, p. 119, pl. 44, figs. 9–12, 15, 16.

TYPE LOCALITY. Strait of Magellan.

Possession Bay Patagonia (Hassler Exped. 1872, ex Mus. Comp. Zool. Massachusetts).
Straits of Magellan, Chile (W. J. Eyerdam, 1939).

RANGE. Magellan, Patagonia and Tierra del Fuego.

This is a solid, high-conical, rounded-oval shell with strong, rather smooth radial ribs. The central area is dark bronzy brown.

Reeve's *venosa* (=*chiloensis*), from the Island of Chiloe, is a relatively smooth, more rounded form, which may be a regional subspecies.

Length 51 mm.; breadth 40 mm.; height 28 mm. (Straits of Magellan).
Length 51 mm.; breadth 38·5 mm.; height 25 mm. (Possession Bay).
Length 46 mm.; breadth 43 mm.; height 25 mm. (Straits of Magellan).

Patinigera aenea (Martyn)

Patella aenea Martyn, 1784, pl. 17.
Patella deaurata Gmelin, 1791, p. 3719.
Patella varicosa Reeve, 1854, fig. 21.
Nacella strigatella Rochebrune & Mabille, 1885, p. 110.
Nacella aenea and *aenea deaurata*, Pilsbry, 1891, pp. 117, 118, pl. 15, figs. 5, 6; pl. 45, figs. 22, 23; pl. 46, figs. 28–36.
Patinella deaurata Strebel, 1908, p. 80.
Helcioniscus bennetti Preston, 1913, p. 221, pl. 4, fig. 7.

Strebel's *Patinella delicatissima* (1907, p. 145 and 1908, pl. 1, figs 75, 75*a*) is a benthic form of the above.

TYPE LOCALITY. Strait of Magellan.

North-east coast, Tierra del Fuego (R. T. Reynolds, 1934); Falkland Is. (W. R. le. B. Tomlin & A. G. Bennett).

RANGE. Tierra del Fuego, Strait of Magellan and Falkland Is.

This species is larger and more elongate-ovate than *magellanica* and has the strong radial ribs prominently scaled by the concentric growth lines. Thin shells with a near anterior apex were subspecifically separated as *deaurata* by Pilsbry (1891), but this does not seem warranted. If, however, the move to ban Martyn's names becomes generally accepted, then Gmelin's *deaurata* must come into use for the species.

Length 33·5 mm.; breadth 23·0 mm.; height 10·0 mm. (Falkland Islands).
Length 55·5 mm.; breadth 38·0 mm.; height 23·0 mm. (Falkland Islands).
Length 60·5 mm.; breadth 43·0 mm.; height 25·5 mm. (Falkland Islands).
Length 70·0 mm.; breadth 46·0 mm.; height 32·0 mm. (Tierra del Fuego).

Patinigera delicatissima (Strebel)

Patinella delicatissima Strebel, 1907, p. 145, pl. 5, figs. 71, 72.
Patinella delicatissima Strebel, 1908, pl. 1, figs. 75, 75*a*.
Patella delicatissima Melvill & Standen, 1914, p. 114.

TYPE LOCALITY. Strait of Magellan, 20–30 fathoms.

St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 115 m.
St. 55. Entrance to Port Stanley, East Falkland Is., 2 cables S 24° E of Navy Point, 16 May 1926, 10–16 m.
St. 56. Sparrow Cove, Port William, East Falkland Is., 1½ cables N 50° E of Sparrow Point, 16 May 1926, 10½–16 m.

This is a small, thin species of low profile with delicately squamose ribs. It is apparently constant and not merely a benthic form of *aenea*. Strebel (1907) recorded it from Berkeley Sound, 16 m., and Port Louis, 7 m., Falkland Islands, and Melvill & Standen (1907) from Rapid Point and Roy Cove, West Falkland Islands, at low water.

Patinigera polaris (Hombron & Jacquinot)

Patella polaris Hombron & Jacquinot, 1841, p. 191.
Patella polaris Martens & Pfeffer, 1886, p. 101, pl. 2, figs. 11–13.
Nacella polaris Pilsbry, 1891, p. 120, pl. 49, figs. 21–27.
Patinella polaris Strebel, 1908, p. 81, pl. 5, fig. 77.
Nacella (*Patinella*) *polaris* Lamy, 1911 *a*, p. 15.
Nacella (*Patinigera*) *polaris* L. David, 1934, nos. 2–3, p. 127.

Type locality. South Georgia (littoral).

St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, Shore Coll.
St. 163. Paul Harbour, Signy I., South Orkneys, 17 Feb. 1927, 18–27 m.
St. 164. East end of Normanna Strait, South Orkneys, 18 Feb. 1927, 24–36 m.
St. 166. South-east point of Paul Harbour, Signy I., South Orkneys, 19 Feb. 1927, Shore Coll.
St. 173. Port Foster, Deception I., South Shetlands, 28 Feb. 1927, 5–60 m.
St. 179 Melchior I., Schollaert Channel, Palmer Archipelago, in creek to south of south-west anchorage, 10 Mar. 1927, 4–10 m.
St. 456. 1 mile east of Bouvet I., 18 Oct. 1930, 40–45 m.
St. 1092. Signy I., South Orkneys, 23 Jan. 1933, Shore Coll.
St. 1486. Harmony Cove, Nelson I., South Shetlands, 3 Jan. 1935, Shore Coll.
St. 1487. Desolation I., Livingston I., South Shetlands, 8 Jan. 1935, Shore Coll.
Wilhelmina Bay, Danco Land, South Shetlands, 64° 30′ S, 62° W, 8 Feb. 1922, 1–8 fathoms, A. G. Bennett.
St. WS 564. Moltke Harbour, South Georgia, 24 Feb. 1931, in rock pool.

Range. South Georgia, South Orkneys, South Shetlands, Palmer Archipelago and Bouvet Island Discovery'), Seymour I. and Paulet I. (Strebel, 1908), 0–60 m.

This strictly Antarctic limpet is, typically, large, elevated, oblongovate, lightly built, sparingly and eakly radially ribbed, mostly smooth, drab externally and more or less uniformly bronzy black within. xamples from below the littoral are of paler colour—bronzy reddish brown within.

Length 51 mm.; breadth 36 mm.; height 23 mm. (South Georgia).
Length 48 mm.; breadth 35 mm.; height 26 mm. (South Georgia).
Length 48 mm.; breadth 34 mm.; height 25 mm. (South Shetlands, St. 1487).
Length 58 mm.; breadth 42 mm.; height 19 mm. (Palmer Archipelago, St. 179).

atinigera polaris concinna (Strebel)

Patinella polaris concinna Strebel, 1908, p. 82, pl. 5, figs. 76*a–e*, 78*a*, *b*.

Type locality. Cumberland Bay, South Georgia, 15–25 m.

. Typical form, with crisp radials:

St. 145. Stromness Harbour, South Georgia, between Grass I. and Tonsberg Point, 7 Jan. 1927, 26–35 m.
St. WS 25. Undine Harbour (north), South Georgia, 17 Dec. 1926, 18–27 m.
St. MS 12. East Cumberland Bay, 1 cable E to 1 mile S × E½, east of Hobart Rock, South Georgia, 17 Feb. 1925, 25–53 m.
St. MS 66. East Cumberland Bay, 2¼ miles south-east of King Edward Point Lt. to 1½ cables W × N of Macmahon Rock, South Georgia, 28 Feb. 1926, 18 m.

. Depressed form, radials obsolete towards margin:

St. MS 6. East Cumberland Bay, ¼ mile south of Hope Point to 1¼ cables S × E of King Edward Point Lt., 12 Feb. 1925, 24–30 m.
St. MS 10. East Cumberland Bay, ¼ mile south-east of Hope Point to ¼ mile south of Government Flagstaff, 14 Feb. 1925, 27 m.
St. MS 71. East Cumberland Bay, 9¼ cables E × S to 1·2 miles E × S of Sappho Point., South Georgia, 9 Mar. 1926, 110–60 m.

Range. South Georgia, 15–110 m.

A benthic form of *polaris*. Typically it is small, thin-shelled, moderately elevated, with narrow, crisp adials crossed by dense concentric growth lines. Colour buff, blotched or variously marked in reddish rown. With it (Form B) is a very depressed form which reaches a larger adult size and is probably the dult *concinna*. It commences with crisp radials on a normally conic shell, but later flattens out, the adials become either obsolete or are present as very weak corrugations, but the concentric growth lines ersist over the whole shell.

The *concinna* form is represented in the collections only from South Georgia. Benthic shells from the South Orkneys and South Shetlands have the shape and sculpture of typical *polaris*.

Form A (typical):

Length 27·25 mm.; breadth 19·0 mm.; height 8·0 mm. (St. MS 12).
Length 28·75 mm.; breadth 20·0 mm.; height 8·5 mm. (St. MS 66).
Length 20·70 mm.; breadth 14·0 mm.; height 4·5 mm. (Strebel, 1908).
Length 32·00 mm.; breadth 21·5 mm.; height 7·7 mm. (Strebel, 1908).

Form B:

Length 35·75 mm.; breadth 24·6 mm.; height 8·5 mm.
Length 36·00 mm.; breadth 24·5 mm.; height 7·0 mm.
Length 39·50 mm.; breadth 27·5 mm.; height 9·5 mm.
Length 42·00 mm.; breadth 29·0 mm.; height 9·0 mm.
(St. MS 10).

A near relative to *polaris* is the Kerguelen Island *Patella* (*Patinella*) *kerguelenensis* Smith (1879, p. 177, pl. 9, figs. 13, 13*a*). This has a large thin elevated shell with subobsolete radial sculpture, very like *polaris* except for a constant narrowing of the anterior end which results in a true oval outline. Hedley (1916, p. 44) recorded this species from Macquarie Island, but I have not seen the material.

Family LEPETIDAE

Genus **Lepeta** Gray, 1840

Type (monotypy): *Patella caeca* Mueller, Boreal Seas

Lepeta coppingeri (Smith)

Tectura (*Pilidium*) *coppingeri* Smith, 1881, p. 35, pl. 4, figs. 12, 12*a*.
Tectura coppingeri Rochebrune & Mabille, 1889, p. H. 90.
Lepeta coppingeri Pilsbry, 1891, p. 71, pl. 39, figs. 20, 21.
Lepeta (*Pilidium*) *antarctica* Smith, 1907, p. 12, pl. 2, figs. 11, 11*a*.
Pilidium coppingeri Strebel, 1907, p. 110, pl. 3, fig. 38.
Pilidium coppingeri Strebel, 1908, p. 83.
Lepeta antarctica Hedley, 1911, p. 4.
Lepeta coppingeri Smith, 1915, p. 62.
Lepeta coppingeri Hedley, 1916, p. 41.
Lepeta coppingeri Eales, 1923, p. 6.

TYPE LOCALITIES. Sandy Point, 9–10 fathoms, Patagonia (*coppingeri*); McMurdo Sound, 130 fathoms (*antarctica*).

St. 1652. Ross Sea, 75° 56·2′ S, 178° 35·5′ W, 23 Jan. 1936, 567 m. (one example).
St. WS 246. Off south end of West Falkland Is., 52° 25′ S, 61° W, 19 July 1928, 267–208 m. (one empty shell).

Family FISSURELLIDAE

Genus **Fissurella** Lamarck, 1799

Type (monotypy): *Patella nimbosa* Linné, 1758

Subgenus **Balboaina** Farfante, 1943

Type (monotypy): *Patella picta* Gmelin, 1791

The subgenus *Balboaina* was proposed for large species (up to 100 mm. in length) with the shell margin entirely in one plane, not crenulated and with a broad dark internal border. Orifice a little in front of the middle and surrounded internally by a broad callus. Distribution: Chile and Magellan Province.

issurella (Balboaina) picta (Gmelin)

Patella picta Gmelin, 1791, p. 3729.
Fissurella picta Hupé (Gay), 1854, p. 237.
Fissurella picta Rochebrune & Mabille, 1889, p. 70.
Fissurella picta Pilsbry, 1890, p. 144, pl. 45, figs. 9–11.
Fissurella picta Melvill & Standen, 1907, p. 98.
Fissurella picta Strebel, 1906, p. 83.

TYPE LOCALITY. Strait of Magellan.

St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 105–115 m. (small dead shells only).

Port Stanley, Falkland Is. (A. G. Bennett and J. R. le B. Tomlin).

RANGE. Valparaiso, Chile (Pilsbry, Gay); Tierra del Fuego (Strebel); Santa Cruz, Punta Arenas nd Baie Orange (Rochebrune and Mabille); Port Stanley, Falkland Is. (Melvill & Standen and trebel).

Length 17·5 mm.; breadth 11·0 mm.; height 4·0 mm. (St. 51).
Length 60·0 mm.; breadth 39·0 mm.; height 16·0 mm. (Falkland Islands).
Length 84·5 mm.; breadth 54·5 mm.; height 26·0 mm. (Falkland Islands).
Length 86·0 mm.; breadth 55·5 mm.; height 27·0 mm. (Falkland Islands).

issurella (Balboaina) oriens Sowerby

Fissurella oriens Sowerby, 1834, p. 124.
Fissurella oriens Pilsbry, 1890, p. 152, pl. 46, figs. 18, 19; pl. 34, fig. 58.
Fissurella oriens Strebel, 1906, p. 88, pl. 1, figs. 8–14; pl. 2, figs. 15–20.
Fissurella oriens Melvill & Standen, 1907, p. 97.
Fissurella oriens Strebel, 1908, p. 78, pl. 6, fig. 97*a*, *b*.

TYPE LOCALITY. Valparaiso, Chile.

St. 51. Off Eddystone Rock, East Falkland Is., 4 May 1926, 105–115 m. (one small empty shell).

Port Stanley, Falkland Is. (ex Australian Museum).

Length 24·0 mm.; breadth 12·0 mm.; height 4·0 mm. (Falkland Islands).
Length 43·0 mm.; breadth 23·0 mm.; height 8·0 mm. (Falkland Islands).
Length 46·0 mm.; breadth 27·0 mm.; height 11·0 mm. (Pilsbry).

RANGE. Coast of Chile and Island of Chiloe (Pilsbry); various Magellan localities including Falkland s. (Strebel); Port William, Falkland Is. (Melvill & Standen, shore; Strebel, 12 m.).

The two species occur together at the Falkland Islands, but do not seem to intergrade. The species *icta* reaches a large size, has an ovate outline, and the length of the orifice is one-seventh to one-ighth that of the shell; '*oriens*' is smaller, narrow, with parallel sides, and the length of the orifice is ne-sixth that of the shell. The former is white, conspicuously rayed with dark purplish brown and the tter diffused greyish and reddish purple, in concentric zones and crossed by reddish radials. I have o topotypic material of *oriens*, so cannot comment on the correctness or otherwise of applying the name f a Chilean species to Falkland Islands material.

Genus **Megatebennus** Pilsbry, 1890

Type (o.d.): *Fissurellidea bimaculata* Dall, California

egatebennus patagonicus Strebel

Megatebennus patagonicus Strebel, 1907, p. 98, pl. 2, fig. 23*a–f*.
Megatebennus patagonicus Strebel, 1908, p. 79.

TYPE LOCALITY. Lennox I., Tierra del Fuego.

St. 57. Port William, East Falkland Is., 5½ cables S 20° W of Sparrow Point, 16 Ma 1926, 15 m. (one example).

Genus Puncturella Lowe, 1827

Type (o.d.): *Patella noachina* Linn.

The southern Puncturellas have long proved to be a stumbling block, and most authors have lumped the southern records with the boreal *noachina*. Certainly on external shell characters there is no marked difference between the northern *noachina* and the Antarctic-Subantarctic shells.

Dall, however (1889*a*, pp. 356–7), revived *falklandica* A. Adams for shells from 449 fathoms, west coast of Patagonia. He remarked concerning these Patagonian shells that they are 'amazingly like *P. noachina*; the only differences I have been able to see in the shells are that in *P. noachina* the fissure is generally longer and less vertical, and the apex more posterior'.

Dall did not examine the dentition of his southern shells, but I have found the radula of *conica* (=*falklandica*) from St. 27, South Georgia, to show striking differences from the figures of the Greenland *noachina* in Troschel & Thiele (1891, pl. 27, fig. 2).

Allowing for differences in interpretation of these small radulae, especially difficult in the Rhipidoglossa, owing to the numerous minute and crowded marginals and the large hooked outer lateral, which assumes a different shape with the varying angles taken up in mounting, there is a marked difference between the central and inner laterals in northern and southern examples. Since the central and inner laterals always lie in one flat plane, and are easily seen, the differences noted between Troschel & Thiele's figure and my slides demonstrate that in spite of similarity in the shells *noachina* can no longer be applied to these southern shells.

The difficulty, now, is to determine how many of the names that have been proposed for southern shells represent valid species, and which of these names is applicable to the Discovery material.

Rimula conica d'Orbigny (1841, p. 471) from the Falkland Islands is a juvenile of 4 mm. in length, tall and strongly recurved at the apex. It can be matched exactly with young examples from the Discovery material.

Cemoria princeps Mighels (1841, p. 42, pl. 4, fig. 9), type locality Maine, is a synonym of typical *noachina*.

Puncturella cognata Gould (1852, p. 321, pl. 31, fig. 478), Orange Harbour, 16 fathoms, Patagonia, is not so laterally compressed and has weaker sculpture than the Discovery material.

P. analoga Martens (1903, p. 70, pl. 5, fig. 8), Kerguelen Island (length 8 mm., breadth 5 mm., height 5 mm.), is sculptured with strong radials and can be matched with half-grown shells from the Discovery material. Recorded from Macquarie Island by Hedley (1916, p. 37), and Tomlin (1948).*

P. spirigera Thiele (1912). Evidently a distinct species with regular ribs separated by linear grooves; a tall shell with strongly recurved apex.

Puncturella conica (d'Orbigny)

Rimula conica d'Orbigny, 1841, p. 471.
Cemoria falklandica A. Adams, 1862, p. 208, fig. 14.
Puncturella noachina Watson, 1886, p. 42.
Puncturella falklandica Dall, 1889*a*, p. 356.
Puncturella falklandica Pilsbry, 1890, p. 231, pl. 63, fig. 33.
Puncturella analoga Martens, 1903, p. 70, pl. 5, fig. 8.
Puncturella noachina Strebel, 1907, pl. 2, figs. 24*a–c*, 25*a–d*.
Puncturella noachina Strebel, 1908, p. 79.
Puncturella noachina Thiele, 1912, p. 234.
Puncturella noachina (='*falklandiana*' sic): Melvill & Standen, 1912, p. 344.

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* Since the above was written I have examined this B.A.N.Z.A.R.E. material consisting of fifty-one specimens, and find that they are constant in having very weakly developed radials. These Macquarie Island shells are probably neither *conica* nor *analoga*, but topotypes of the latter are required to determine this.

TYPE LOCALITIES. Falkland Is. (*conica* and *falklandica*); Kerguelen I. (*analoga*).

St. 27. West Cumberland Bay, South Georgia, 3·3 miles S 44° E of Jason L., 15 Mar. 1926, 110 m.
St. 42. Off mouth of Cumberland Bay, South Georgia, 1 Apr. 1926, 120–204 m.
St. 144. Off mouth of Stromness Harbour, South Georgia, 5 Jan. 1927, 155–178 m.
St. 156. Off north coast of South Georgia, 53° 51′ S, 36° 21′ 30″ W, 20 Jan. 1927, 200–236 m.
St. 159. North-east of South Georgia, 52° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.
St. 170. Off Cape Bowles, Clarence Is., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m.
St. 175. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.
St. 1562. Near Marion I., from 46° 51′ 7″ S, 37° 56′ 5″ E to 46° 54′ 8″ S, 37° 53′ 8″ E, 7 Apr. 1935, 97–104 m.
St. WS 85. 8 miles S 66° E of Lively I., East Falkland Is., 25 Mar. 1927, 79 m.
St. WS 228. North-east of Falkland Is., 50° 50′ S, 56° 58′ W, 30 June 1928, 229–236 m.
St. WS 246. South-west Falkland Is., 52° 25′ S, 61° W, 19 July 1928, 267–208 m.
St. WS. 799. North-west of Falkland Is. 48° 04′ 15″ S, 62° 48′ 07″ W, 21 Dec. 1931, 141–137 m.
St. WS 824. South-east of Falkland Is., 52° 29′ S, 58° 27′ W, 19 Jan. 1932, 146–137 m.
St. MS 71. East Cumberland Bay, 9¼ cables E × S to 1·2 miles E × S of Sappho Point, 9 Mar. 1926, 110–60 m.

RANGE. Approximately Magellan to Kerguelen I. (possibly Macquarie Island) and south to Bransfield rait, 60–342 m. (449 fathoms, Dall, 1889, loc. cit.).

Length 16·0 mm.; breadth 9·8 mm.; height 11·4 mm. (St. 27).
Length 9·0 mm.; breadth 6·0 mm.; height 5·2 mm. (St. WS 228).
Length 8·8 mm.; breadth 6·0 mm.; height 6·8 mm. (St. 170).
Length 7·0 mm.; breadth 5·25 mm.; height 4·25 mm. (*noachina*, Pilsbry, 1890, p. 230).

Forbes & Hanley (1850) state that their largest example of *noachina* 'measures four lines in breadth d rather exceeds five in length'.

DENTITION. (Fig. G, 2, p. 189, from example of length 16 mm., breadth 9·8 mm., height 11·4 mm., . 27.) The four laterals are all narrow and lie erect and parallel to the axis of the central, not oblique it as in *noachina* (Fig. G, 1, p. 189).

Genus **Parmaphorella** Strebel, 1907

Type (monotypy): *Tugalia antarctica* Strebel 1907 (*non* Melvill & Standen 1907)

(See Tomlin, 1932, p. 163)

armaphorella melvilli (Thiele)

Tugalia antarctica Melvill & Standen, 1907, p. 98, pl., fig. 1 (*non* Strebel, 1907).
Tugalia melvilli Thiele, 1912, p. 257.

TYPE LOCALITY. Burdwood Bank, South of Falkland Is. in 56 fathoms.

St. 388. Off Tierra del Fuego, 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m.
St. WS 825. North-east of Falkland Is., 50° 50′ 00″ S, 57° 15′ 15″ W, 18–19 Jan. 1932, 135–144 m.

DENTITION. Fig. G, 3, p. 189. $\infty+(1+1+4)+1+(4+1+1)+\infty$. Central tooth broad but reduced ove to a comparatively narrow cutting edge. Four narrow laterals lying parallel to the oblique sides the central—fourth lateral pointed but without a cutting edge—fifth lateral massive, hooked and with prominent cusp in addition to the terminal cutting point. There is a sixth incipient or obsolescent teral, which is less than half the size of the fifth. Similar accessory plates are shown in *Puncturella* and Thiele's figures of the dentition of several Fissurellids, e.g. *Emarginula obovata*, *E. elongata* and *cutus australis* (1891). The marginals are very numerous, slender and curved, and all are delicately sped towards the outer extremity.

Three species of the genus are known: *antarctica* (Strebel, 1907) from Strait Le Maire, Tierra del uego; *melvilli* (Thiele, 1912) and *barnardi* (Tomlin, 1932) from Cape Point, South Africa, in 180 fathoms.

THE TROCHACEA

The radula

The Rhipidoglossid radula is undoubtedly one of the most difficult to interpret owing to the larg number and the intricate overlapping of the teeth. In the Calliostomid radula in particular, long slender, foliated cusps form a complicated network that effectively obscures the form of the bases of th individual teeth unless these teeth are laboriously segregated on the slide. Even then it is difficult t estimate the outlines these teeth would present when viewed from above in their natural workin position. Each angle from which an individual tooth is observed gives a different result, especiall with the laterals.

I have achieved the best results, where there is sufficient material, by mounting several radulae— one stained with eosin and mounted in Canada balsam, one unstained and mounted in glycerine jell and one or more in either medium with individual teeth and groups of teeth segregated from the mass Staining is essential to bring out the form of the base, but by this method the elaborate foliated cusp so characteristic of the Calliostomids are not easily seen. On the other hand, glycerine jelly brings ou detail of the cusps to perfection but shows little else.

In general terms the dental formula of the Trochacea consists of a central tooth, four to sixtee laterals (usually four to five) and a large number of marginals (usually too many to count with accurac (expressed as ∞)). The inner marginal in the Calliostomidae is always massive and clearly the mos effective working tooth. The rest of the teeth are so delicate that they can scarcely be operative i mastication.

The radula types covered by the present material are as follows:

A. Marginal teeth very numerous.
  a. Central and laterals with long, slender, foliated cusps.
    aa. Inner marginal massive, crooked, with cusps on lower edge. **Calliostomatina**
  b. Central and lateral teeth with short denticulated cusps.
    bb. Inner marginal not noticeably larger or more massive than neighbouring ones **Stomatellinae = Margaritina**
      Transverse rows forming a simple arc **Margarite**
      Transverse rows with a slight dip at the middle **Margarell**

B. Marginal teeth few (5–10).
  Transverse rows with a pronounced dip at the middle. **Solariellina**

The epipodial processes

Interesting confirmation of differences shown by study of the Trochoid radula is shown by th tentacles or filaments associated with the epipodial fringe.

Calliostoma Swainson, 1840 (type: *Calliostoma zizyphinum* (Linn.) England).

Two long, slender cephalic tentacles with the eyes at the extremities of a pair of short tentacles, eac close against the outer side of the base of one of the long tentacles. Epipodial tentacles, three on eac side of the foot, long and slender (see Forbes & Hanley, 1851, 3, pl. EE and Fischer, 1887, p. 826 fig. 585).

1. **Calliostoma modestulum** Strebel. Two long slender cephalic tentacles and eyes as in *Calliostom* typical. Epipodial tentacles four on each side of the foot, long and slender (Fig. D, 1).

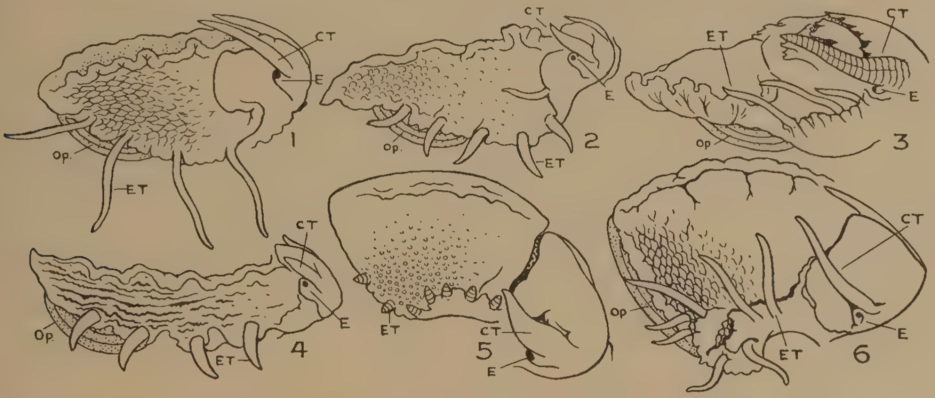
Dall (1889 *a*, p. 343), in describing *C. platinum*, 414 fathoms, California, stated that there were fou moderate-sized epipodial 'filaments' and that the tentacles were long and slender.

In *Venustas cunninghami* (Griffiths & Pidgeon), New Zealand, the cephalic tentacles are short and tout and there are four pairs of short epipodial tentacles.

2. **Photinula coerulescens** (King & Broderip). Two short cephalic tentacles. Epipodial tentacles ix pairs, slender, moderately long, and of approximately equal size (Fig. D, 4).

3. **Photinastoma taeniata** (Wood). Two short cephalic tentacles. Epipodial tentacles four pairs, ather short and stout and of equal size (Fig. D, 2).

4. **Venustatrochus georgianus** n.g. and n.sp. Two long and slender cephalic tentacles. Epipodial ntacles seven pairs, all slender, first two short, remainder long (Fig. D, 6).



ig. D. Epipodial processes in Trochoids. *CT* = cephalic tentacles, *ET* = epipodial processes and *Op* = opercula in: (1) *Calliostoma modestulum* Strebel; (2) *Photinastoma taeniata* (Wood); (3) *Solariella kempi* n.sp.; (4) *Photinula coerulescens* (King & Broderip); (5) *Falsimargarita iris* (Smith); (6) *Venustatrochus georgianus* n.g., n.sp.

5. **Falsimargarita iris** (Smith). Two short and very stout cephalic tentacles. Epipodial tentacles even pairs, very short and stout and of equal size (Fig. D, 5).

Eales (1923, p. 8) described *F. gemma* (Smith) as being similar but with the epipodial tentacles carcely distinguishable from the lobes of the epipodial fringe.

6. **Margarella expansa** (Sowerby); also *steineni* (Strebel), *bouveti* n.sp., *M.* (*Promargarita*) *tropi-phoroides* Strebel and *achilles* (Strebel). All with short and stout cephalic tentacles and four pairs of oderately long epipodal tentacles, which increase in size gradually from the front.

7. **Margarella antarctica** (Lamy). Similar to the typical *Margarella* series listed above except for ve instead of four pairs of epipodial tentacles.

Family TROCHIDAE

Subfamily CALLIOSTOMATINAE

Genus **Calliostoma** Swainson, 1840

Type (S.D. Herrmannsen, 1846): *Trochus conulus* Linn.

The Magellanic Calliostomids seem to have more affinity with West American stock than with uropean typical members. As already mentioned, *Calliostoma* typically has three pairs of long, slender, pipodial tentacles, whereas the Magellanic *modestulum* has four. In the latter, also, the central tooth of e radula is narrow with a deep base and the laterals have the cusps on long slender necks. *C. platinum* all, 414 fathoms, California, has four long epipodial tentacles, and *C. annulatus* Martyn, California, as 'goose-necked' laterals. The New Zealand *Venustas cunningham* (G. & P.) has four pairs of short pipodial tentacles, but the central and lateral teeth are more like those of typical *Calliostoma*.

On shell characters the Magellanic *nordenskjoldi*, *modestulum* and *anderssoni* appear respectively to belong to distinct groups, but there is scarcely any difference in dentition between *nordenskjoldi* and *modestulum*.

There is insufficient comparative material available to me properly to evaluate the differences indicated by the dentition, so for the present the Magellanic members are retained in *Calliostoma* (*sensu lato*).

Calliostoma nordenskjoldi Strebel

Calliostoma nordenskjoldi Strebel, 1908, p. 66, pl. 1, figs. 5, 5*a*, *b*.

Type locality. Coast of northern Argentina, 37° 50′ S, 56° 11′ W, 100 m.

St. WS 776. Gulf of St. George, Patagonia, 46° 18′ 15″ S, 65° 02′ 15″ W, 3 Nov. 1931, 107–99 m. (one living example).

Dentition. Fig. H, 22, p. 190. $(\infty+1)+4+1+4+(1+\infty)$. The central tooth of the radula in the above species, *coppingeri*, *modestulum* and the new genus *Photinastoma*, differ from that of typical *Calliostoma* in having a narrow and deep base. The laterals in this group are elaborately foliated and attached to their bases by slender extensions like 'goose-necks'. The central tooth in *nordenskjoldi* is distinctive, in that although most of the tooth is narrow it suddenly widens at the base.

Calliostoma modestulum Strebel

Calliostoma modestulum Strebel, 1908, p. 70, pl. 1, figs. 13*a*, *b*.
Calliostoma modestulum Melvill & Standen, 1912, p. 347.

Type locality. South of Falkland Is., 52° 29′ S, 60° 36′ W, 197 m.

St. 1321. From 4 miles S 72° W of East Tussac Rock, Cockburn Channel, to 5·6 miles S 75° W of East Tussac Rock, Tierra del Fuego, 16 Mar. 1934, 66 m.
St. WS 72. North of Falkland Is., 51° 07′ S, 57° 34′ W, 5 Mar. 1927, 79 m.
St. WS 80. North-west of Falkland Is., 50° 58′ S, 63° 39′ W to 50° 55′ 30″ S, 63° 36′ W, 14 Mar. 1927, 152-156 m.
St. WS 81. 8 miles N 11° W of North I., West Falkland Is., 19 Mar. 1927, 81–82 m.
St. WS 212. North of Falkland Is., 49° 22′ S, 60° 10′ W, 30 May 1928, 242–249 m.
St. WS 225. North-west of Falkland Is., 50° 20′ S, 62° 30′ W, 9 June 1928, 162–161 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.
St. WS 250. North of Falkland Is., 51° 45′ S, 57° W, 20 July 1928, 251–313 m.
St. WS 750. North-east of Falkland Is., 50° 50′ S, 57° 15′ 13″ W, 18–19 Jan. 1932, 135–144 m.
St. WS 877. Off south-west coast of West Falkland Is., 52° 35·5′ S, 61° 04′ W, 4 Apr. 1932, 350–0 m.

Range. From 49° 22′ to 52° 29′ S and 57° 15′ 13″ to about 65° W in 66–350 m. Falklands area to Tierra del Fuego and Patagonia.

Dentition. Fig. H, 15, p. 190. $(\infty+1)+5+1+5+(1+\infty)$. Central tooth narrow with a deep base, laterals foliated and 'goose-necked'. Innermost marginal massive and hooked with seven strong cusps on its inner distal face and a row of denticles near the outer distal edge.

Animal. Two long, slender cephalic tentacles and eyes at the end of short stalks at the outer base of each tentacle as in typical *Calliostoma*. Four pairs of long, slender, epipodial tentacles.

Calliostoma falklandicum Strebel

Calliostoma falklandicum Strebel, 1908, p. 69, pl. 6, fig. 89*a*–*d*.

Type locality. Port Albemarle, Falkland Is., 52° 9′ S, 60° 33′ W, 15 m.

St. WS 97. North-west of Falkland Is., 49° S, 62° W to 49° 01′ S, 61° 56′ W, 18 Apr. 1927, 146–145 m.
St. WS 225. North-west of Falkland Is., 50° 20′ S, 62° 30′ W, 9 June 1928, 162–161 m.
St. WS 237. North of Falkland Is., 46° S, 60° 05′ W, 7 July 1928, 150–256 m.

St. WS 239. North-west of Falkland Is., 51° 10′ S, 62° 10′ W, 15 July 1928, 196–192 m.
St. WS 784. North of Falkland Is., 49° 47′ 45″ S, 61° 05′ W, 5 Dec. 1931, 170–164 m.
St. WS 804. North-west of Falkland Is., 50° 22′ 45″ S, 62° 49′ W, 6 Jan. 1932, 143–150 m.
St. WS 824. Off East Falkland Is., 52° 29′ S, 58° 27′ W, 19 Jan. 1932, 146–137 m.
St. WS 829. North-west of Falkland Is., 50° 51′ S, 63° 13′ 30″ W, 31 Jan. 1932, 155–0 m.
St. WS 854. Off Golfo de San Jorge, Patagonia, 45° 16′ S, 64° 25′ W, 22 Mar. 1932, 97 m.

RANGE. From 45° 16′ to 52° 9′ S and 58° 27′ to 64° 25′ W. in 15-256 m., Falklands area to Golfo e San Jorge, Patagonia.

In addition to the above, Strebel (1908) described a third species, *venustulum*, from Port Albemarle, alkland Islands, at 40 m.

All three are closely allied and may yet prove to be variations of a single species.

The Discovery material is covered by both *modestulum* and *falklandicum*, but no examples of the ronger sculptured *venustulum* were taken. The chief differences between *modestulum* and *falklandicum* e that the former has a rounded periphery and only subobsolete spirals on the base, whereas the latter carinated by a peripheral ridge and has several distinct spirals on the inner part of the base, bordering e pillar. The third member of the group, *venustulum*, resembles *falklandicum*, but has granulated irals on the upper portion of each whorl.

Taking the station lists for both *modestulum* and *falklandicum*, only two stations, WS 80 and WS 225, roduced both species, but on the other hand only one or two examples were taken at most of the ations.

The two forms do not indicate obvious bathymetric variation except that *modestulum* alone is presented at the deepest station, 350 m. The range is similar also, except that on the available records *lklandicum* extends farther northwards and *modestulum* farther westwards than the centre of distribution, which appears to be just north of the Falklands.

alliostoma sp.

Specimens from three Magellanic stations have the shape of *falklandicum* but have three broad spiral ands of pink on the spire whorls. The carina bears a smooth raised spiral ridge, and there are two bsidiary spiral cords on the upper surface of the whorls. They closely resemble Strebel's (1905) gure of *C. nuda roseotincta* and *C. optimum* Rochebrune & Mabille (1889). Compare also *nuda* hilippi, *nuda flavidocarnea*, *irisans* and *kophameli* Strebel, *dozei* Rochebrune & Mabille and *consimilis* mith.

I am unable to determine satisfactorily the undermentioned material since it does not include adults d there are a number of Magellan species, all very similar as far as one can judge from descriptions d figures.

St. 1321. From 4 miles S 72° W of East Tussac Rock, Cockburn Channel, to 5·6 miles S 75° W of Tussac Rock, Tierra del Fuego, 16 Mar. 1934, 66 m.
St. WS 222. South-east of Point Desire, Patagonia, 48° 23′ S, 65° W, 8 June 1928, 100–106 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.

alliostoma coppingeri (Smith)

Trochus (*Zizyphinus*) *coppingeri* Smith, 1880, p. 320.
Calliostoma coppingeri Dall, 1889*a*, p. 344, pl. 12, fig. 4.

TYPE LOCALITY. Mouth of Rio de la Plata, 28 fathoms, Argentina.

St. WS 852. 44° 12·5′ S, 64° 13′ W, 21 Mar. 1932, 86–88 m.

DENTITION. Fig. H, 18, p. 190.

RANGE. Off Rio de la Plata, 10 fathoms, and off Cape Delgado, 43 fathoms (Dall, 1889).

Genus Venustatrochus n.g.

Type: *V. georgianus* n.sp.

This genus is provided for a benthic species from South Georgia, which on external shell features is not dissimilar from normal deep-water thin-shelled Calliostomids. The dentition, however, is so different from that of typical *Calliostoma*, *Photinula* and the *Photinula*-like Calliostomids of the Magellan Province that generic separation is essential. Normal Calliostomids exhibit a radula with from four to seven laterals and a central tooth with a simple, more or less rectangular base, which is deeper than it is broad. The inner marginal is massive, long and somewhat crooked at the end, and bears on the underside a small number of prominent comb-like denticles. The central and laterals have long and slender curved cusps which are delicately serrated, and it is difficult to imagine how they can be effectively used without suffering damage.

The radula of *Venustatrochus* resembles that of the Calliostomids in the possession of large inner marginals with comb-like cusps and elaborately serrated, slender, curved cusps on the central and laterals. The discordant features are shown in the central tooth, which has a long, very narrow cusp on a large diamond-shaped base, and in the laterals, which are as the central except for being cut away on the inner side of the base. The most remarkable difference is in the number of laterals (sixteen) which is greater than in any other known Trochoid.

Formerly the West Indian *Livonia pica*, which has nine laterals, was quoted as the Trochoid with the largest known number of these teeth (Fig. H, 17). A curious similarity between the radulae of *Venustatrochus* and *Livonia* is that they both have a diamond-shaped base to the central. In *Livonia* however, the inner marginal is a massive hooked tooth and none of the teeth has the long, slender serrated cusps of the Calliostomids. I do not consider that the resemblances noted between the radulae of *Venustatrochus* and *Livonia* indicate close relationship, and certainly the shell features are discordant in almost every particular.

Venustatrochus georgianus n.sp., Pl. X, fig. 68

Shell large, very thin, conical with biangulate whorls, the lower one coincident with the suture and forming the periphery of the last whorl; imperforate. Colour uniformly pale buff, with a greenish iridescence showing through. Whorls eight (seven in holotype), including the protoconch, which is small but projecting, slightly asymmetrical and consists of one unsculptured whorl somewhat immersed at the tip with a dull, slightly malleated white surface. First two post-nuclear whorls with two spiral threads above the peripheral carina and one below it; third with two above and two below, fourth with six above and three below, fifth with twelve above and ten below, penultimate with seventeen above and sixteen below, and base with about forty threads. The suture is ledged by the uppermost thread, and immediately below this on the later whorls there is a smooth, very slight concavity. The upper surface of the whorls is crossed by retractively arcuate fine dense threads which render the spirals minutely granular, but the basal spirals are smooth. Pillar plain, arcuate, much thickened above and with a spreading callus which completely fills the umbilical area. Interior of aperture iridescent and delicately spirally grooved. Outer lip thin and sharp. Operculum horny, circular, multispiral reddish brown.

Diameter 40·0 mm.; height 40·0 mm. (paratype).

Diameter 32·0 mm.; height 30·5 mm. (holotype).

The smaller specimen is selected for the holotype, since the other has the protoconch missing and the surface is eroded and encrusted.

The species resembles in a general way Dall's *Calliostoma platinum* (1889*a*, p. 343, pl. VII, fig. 2) from ear Santa Barbara Islands, 414 fathoms, California. Since the radula of *platinum* has not been described, ctual relationship with *georgianus* cannot be claimed.

TYPE LOCALITY. St. 42. Off mouth of Cumberland Bay, South Georgia, from 6·3 miles N 89° E of ason Lt. to 4 miles N 39° E of Jason Lt., 1 Apr. 1926, 120–204 m.

DENTITION. Fig. H, 16, p. 190. $(\infty+1)+16+1+16+(1+\infty)$.

Falsimargarita n.gen.

Type: *Margarites gemma* Smith

Eales (1923, p. 8) gave a good description and figure of the dentition of *gemma*. This and the allied pecies *iris* have the radula of the Calliostomid type, that is, with more or less rectangular-based central nd lateral teeth having long curved foliaceous cusps bearing numerous sharp denticles.

The shell is very thin, white or pale cream, iridescent both externally and internally, elaborately ulptured with fine crisp spirals and axial threads and with a deep but relatively narrow umbilicus.

This new genus differs from *Calliostoma* in the thin externally iridescent shell, open umbilicus and in etails of the radula. The broad central tooth, more than twice the width of any of the laterals, is distinctive feature. There is, of course, no relationship to *Margarita*.

alsimargarita gemma (Smith)

Margarites gemma Smith, 1915, p. 62, pl. 1, fig. 1.
Margarites gemma Eales, 1923, pt. 5, p. 8.

DENTITION. Fig. H, 23, p. 190.

TYPE LOCALITY. Off Oates Land, 180–200 fathoms.

St. 175. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.

Major diameter 22·0 mm.; minimum diameter 19·0 mm.; height 18 mm. (holotype).
Major diameter 17·4 mm.; minimum diameter 15·0 mm.; height 15 mm. (St. 175).

The finding of this superb and rare species on the opposite side of Antarctica from the type locality of interest.

The Bransfield Strait specimen agrees in minute detail with Smith's full description and excellent gure, and the radula is exactly as figured by Eales (1923, loc. cit.). The specimen is not quite fully rown.

alsimargarita iris (Smith)

Margarites iris Smith, 1915, p. 91, pl. 2, fig. 4.
Margarites iris Eales, 1923, p. 7.

TYPE LOCALITY. West of Falkland Is., 125 fathoms.

St. WS 245. Between Falkland Is. and Patagonia, 52° 36′ S, 63° 40′ W, 18 July 1928, 304–290 m.
St. WS 818. Between Falkland Is. and Patagonia, 52° 31′ 15″ S, 63° 25′ W, 17 Jan. 1932, 272–278 m.
St. WS 821. Off Falkland Is., 52° 55′ 45″ S, 60° 55′ 00″ W, 18 Jan. 1932, 461–468 m.

Genus Photinula H. & A. Adams, 1854

Type (s.d. Pilsbry 1889), *Margarita coerulescens* King & Broderip

Thiele has shown by his work on Trochoid dentition that *Photinula* is allied to *Calliostoma* (Thiele, 906*c*, pp. 12–15 and 1921, p. 68).

hotinula coerulescens (King & Broderip)

Margarita coerulescens King & Broderip, 1831, p. 346, fig. 54.
Photinula ringei Pfeffer, 1887, p. 133.
Photinula coerulescens Rochebrune & Mabille, 1889, p. H81.

Photinula coerulescens Pilsbry, 1889, p. 278, pl. 44, figs. 18, 19.
Photinula coerulescens Strebel, 1905, p. 140, pl. 5, figs. 25*a*, *b*, 27*a*, *b* and 30.
Photinula coerulescens Strebel, 1908, p. 71, pl. 6, fig. 93*a*, *b*.
Photinula taeniata coerulescens Melvill & Standen, 1914, p. 116.

DENTITION. Fig. H, 24, 190.

TYPE LOCALITY. Strait of Magellan.

St. 51. Off Eddystone Rock, East Falkland Is., 4 May 1926, 115 m.
St. 55. Entrance to Port Stanley, East Falkland Is., 2 cables S 24° E of Navy Point, 16 May 1926, 10–16 m.
St. 56. Sparrow Cove, Port William, East Falkland Is., 1½ cables N 50° E of Sparrow Point, 16 May 1926, 10½–16 m.
St. 1230. 6·7 miles N 62° W from Dungeness Lt., Magellan Strait, 23 Dec. 1933, 27 m.
St. WS 79. Between Falkland Is. and Patagonia, 51° 01′ 30″ S, 64° 59′ 30″ W, 13 Mar. 1927, 132–131 m.
St. WS 80. Between Falkland Is. and Patagonia, 50° 57′ S, 63° 37′ 30″ W, 14 Mar. 1927, 152–156 m.
St. WS 217. North-north-west of Falkland Is., 47° 06′ S, 62° 12′ W, 3 June 1928, 116–114 m.
St. WS 764. Between Falkland Is. and Argentina, 44° 38′ 15″ S, 61° 58′ 30″ W, 17 Oct. 1931, 110–104 m.
St. WS 775. Between Falkland Is. and Argentina, 46° 44′ 45″ S, 63° 33′ W, 2 Nov. 1931, 115 m.
St. WS 782. North of Falkland Is., 50° 29′ 15″ S, 58° 23′ 45″ W, 4 Dec. 1931, 141–146 m.
St. WS 816. Between Falkland Is. and Patagonia, 52° 09′ 45″ S, 64° 56′ W, 14 Jan. 1932, 150 m.
St. WS 817. Between Falkland Is. and Patagonia, 52° 23′ S, 64° 19′ W, 14 Jan. 1932, 191–202 m.
St. WS 834. Off Santa Cruz, Patagonia, 50° 18′ 45″ S, 67° 44′ W, 9 Feb. 1932, 27–38 m.
St. WS 836. Off Patagonia, 53° 05′ 30″ S, 67° 38′ W, 3 Feb. 1932, 64 m.
St. WS 854. Off Patagonia, 45° 16′ S, 64° 25′ W, 22 Mar. 1932, 97 m.
St. WS 869. Between Falkland Is. and Patagonia, 52° 15′ 30″ S, 64° 13′ 45″ W, 31 Mar. 1932, 187–0 m.

RANGE. Southern Argentina to Tierra del Fuego and Falkland Is., 0–202 m.

A handsome, depressed, smooth, pale, opalescent shell with a few conspicuous heavy spiral bands of purplish brown to dark blue, often with subsidary spirals of green and grey.

Genus **Photinastoma** n.g.

Type: *Trochus taeniatus* Wood

The Falkland Islands *taeniatus* is very similar in appearance to the genotype of *Photinula*, but study of the radula and epipodial characters shows that although they are both derivatives from Calliostomid stock they are sufficiently distinct from each other to warrant generic separation. That *taeniatus* is not a typical *Photinula* has been pointed out already by Dall (1889*a*, p. 344), who wrote: 'This species is referred to *Photinula* by H. & A. Adams, but appears to be simply a smooth *Calliostoma*. There is no umbilical callus as in *Photinula coerulescens*...', etc., and by Strebel (1908, p. 71), who segregated it from *Photinula* s.str. under 'Gruppe *Calliostoma-Photinula* Strebel'. This hyphenated combination has been cited as of nomenclatural status by Neave (1939, p. 535), but it seems very clearly indicated that Strebel did not intend this. The manner of presentation of subgenera in this same work of Strebel's proves this, i.e. p. 74 'Gruppe *Promargarita* n.subg.' The question remains, that notwithstanding Strebel's intention, does the entry fulfil the then existing requirements for a new name? The mere hyphenating, without alteration, of two valid generic names, is apparently not covered by the rules, and in my opinion does not amount to the proposition of a new genus or subgenus.

Study of the dentition and epipodial fringe in *taeniatus* and *coerulescens* confirms that although they compare in a general way with *Calliostoma* there are sufficient differences between them to warrant separation.

In *Photinastoma taeniata* the radula is almost identical with that of the Magellan Calliostomids. Also it has four epipodial tentacles as in certain Californian and New Zealand Calliostomids, but not as in the English genotype, which has three. Features of the *taeniata* radula, which are common to the Magellan

Calliostomids, and to the species *Calliostoma annulata* from California but not to the genotype of *Calliostoma*, are the very deep, narrow-based central tooth and the long 'goose-necked' cusps on the aterals.

In *Photinula coerulescens* the laterals are not so conspicuously 'goose-necked' and the central is broad nd shallow-based, more nearly approaching the typical Calliostomid radula. The epipodial tentacles, however, are six, and there is a distinct but small veil covering the top of each cephalic tentacle at its base.

Photinastoma taeniata (Wood)

Trochus taeniatus Wood, 1828, pl. 5, fig. 12.
Photinula taeniata H. & A. Adams, 1858, p. 427.
Photinula taeniata Pilsbry, 1889, p. 278, pl. 44, figs. 18, 19.
Photinula taeniata Rochebrune & Mabille, 1889, p. H87.
Photinula taeniata v. Ihering, 1902, p. 101.
Photinula taeniata Strebel, 1905, p. 135, pl. 5, figs. 28*a*, *b*, 29.
Photinula taeniata var. elata Strebel, 1905, p. 138, pl. 5, fig. 28*c*.
Photinula taeniata Melvill & Standen, 1907, p. 98.
Photinula taeniata Strebel, 1908, p. 71.
Photinula taeniata Melvill & Standen, 1914, p. 116.

DENTITION. Fig. H, 25, p. 190.

TYPE LOCALITY. Unknown. Port Stanley, Falkland Is., here designated.

St. 52. Port William, East Falkland Is., 7·4 cables N 17° E of Navy Point, 5 May 1926, 17 m.
St. 53. Port Stanley, East Falkland Is. (hulk of 'Great Britain'), 12 May 1926, 0–2 m.
St. 55. Entrance to Port Stanley, East Falkland Is., 2 cables S 24° E of Navy Point, 16 May 1926, 10–16 m.
St. 56. Sparrow Cove, Port William, East Falkland Is., 1½ cables N 50° E of Sparrow Point, 16 May 1926, 10½–16 m.
St. WS 834. Off Coy Inlet, Santa Cruz, Patagonia, 52° 57′ 45″ S, 68° 08′ 15″ W, 2 Feb. 1932, 27–38 m.
St. WS 847. Off Santa Cruz, Patagonia, 50° 18′ 45″ S. 67° 44′ 00″ W, 9 Feb. 1932, 56–84 m.

RANGE. Strait of Magellan (Pilsbry, 1889), Patagonia ('Discovery') and Falkland Is. (Strebel, 1905; Melvill & Standen, 1907; 'Discovery'), 0–84 m.

A handsome species with red spiral lines on a smooth pearly white surface.

Photinastoma taeniata nivea (Cooper & Preston)

Photinula taeniata var. *nivea* Cooper & Preston, 1910, p. 112.

TYPE LOCALITY. Falkland Is.

St. 51. Off Eddystone Rock, East Falkland Is., 4 May 1926, 115 m.

This seems to be something more than an albinistic form of *taeniata*. Paratypes, together with the St. 51 material, show the following features not common to *taeniata* typical: no traces of colour pattern, subobsolete spirally incised lines, and a taller spire with more globose whorls. Both species and subspecies have three strong spiral cords on the first post-nuclear whorl. Unfortunately, only empty shells are available.

Subfamily STOMATELLINAE

Genus **Margarella** Thiele, 1893

n.nom. for *Margaritella* Thiele, 1891 *non* Meek & Hayden, 1860
Type (o.d.?): *Margarita violacea* King

Margarella expansa (Sowerby)

Margarita expansa Sowerby, 1838, p. 24.
Margarita expansa Sowerby, 1841, figs. 16, 17.
Photinula expansa H. & A. Adams, 1858, pp. 427–8.
Trochus (*Photinula*) *expansus* E. A. Smith, 1879, p. 167.

Photinula expansa Pilsbry, 1889, p. 279, pl. 39, figs. 51, 52.
Photinula expansa V. Ihering, 1902, p. 99.
Photinula expansa Smith, 1902, p. 207.
Photinula expansa Strebel, 1905, p. 152, pl. 5, figs. 9–11, 14, 15.
Photinula expansa Melvill & Standen, 1907, p. 98.
Photinula (*Margarella*) *expansa* Strebel, 1908, p. 72, pl. 5, fig. 68.
Margarella expansa Thiele, 1912, p. 234.

Type locality. Falkland Is.

St. 51. Off Eddystone Rock, East Falkland Is., 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 105–115 m.
St. 55. Entrance to Port Stanley, East Falkland Is., 2 cables S 24° E of Navy Point, 16 May 1926, 10–16 m.
St. 56. Sparrow Cove, Port William, East Falkland Is., 16 May 1926, 10½–16 m.
St. 58. Port Stanley, East Falkland Is., 19 May 1926, 1–2 m.
St. WS 85. 8 miles S 66° E of Lively I., East Falkland Is., 25 Mar. 1927, 79 m.

Margarella violacea (King)

Margarita violacea King & Broderip, 1830–31, p. 346.
Margarita persica Gould, 1852, p. 192.
Photinula almyris Rochebrune & Mabille, 1885, p. 108.
Photinula halmyris Rochebrune & Mabille, 1889, p. 89, pl. 4, fig. 6.
Photinula violacea Rochebrune & Mabille, 1889 p. 87.
Photinula violacea V. Ihering, 1902, p. 98.
Photinula violacea Strebel, 1905, p. 145, pl. 5, fig. 1–8, 12, 13.
Photinula violacea Smith, 1905, p. 336.
Photinula violacea Melvill & Standen, 1907, p. 99.
Photinula (*Margarella*) *violacea* Strebel, 1908, p. 72.

Type locality. Strait of Magellan.

St. 56. Sparrow Cove, Port William, East Falkland Is., 16 May 1926. 10½–16 m.
St. 724. Fortescue Bay, Magellan Strait, 16 Nov. 1931, 0–5 m. on kelp.
St. 1321. From 4 miles S 72° W of East Tussac Rock, Cockburn Channel, Tierra del Fuego, to 5·6 miles S 75° W of East Tussac Rock, 16 Mar. 1934, 66 m.
St. WS 71. 6 miles N 60° E of Cape Pembroke Lt., East Falkland Is., 23 Feb. 1927, 82–80 m.
St. WS 80. North-west of Falkland Is., 50° 57′ S, 63° 37′ 30″ W, 14 Mar. 1927, 152–156 m.
St. WS 88. North of Le Maire Strait, Patagonia, 54° 00′ S, 64° 57′ 30″ W, 6 April 1927, 118 m.
St. WS 824. Off south-east of Falkland Is., 52° 29′ S, 58° 27′ W, 19 Jan. 1932, 146–137 m.
St. WS 825. Off north-east of Falkland Is., 50° 50′ S, 57° 15′ 13″ W, 19 Jan. 1932, 135–144 m.
St. WS 829. Between Falkland Is. and Patagonia, 50° 51′ S, 63° 13′ 30″ W, 31 Jan. 1932, 155 m.
St. WS 836. Off Patagonia, 53° 05′ 30″ S, 67° 38′ W, 3 Feb. 1932, 64 m.
St. WS 838. Between Falklands Is. and Patagonia, 53° 11′ 45″ S, 65° 00′ W, 5 Feb. 1932, 148 m.
St. WS Shore collecting. Ringdove Inlet, Wide Channel, 7 May 1931.

Range. Magellan Province: Patagonia and Tierra del Fuego (Rochebrune & Mabille, 1885; Strebel, 1905, 1908; 'Discovery'); Falkland Is. (Melvill & Standen, 1907; 'Discovery').

It is often difficult to distinguish between *violacea* and pinkish forms of *expansa*. Typical *expansa* is olivaceous, with a bright green iridescence showing through on the upper whorls, and it has a relatively large ovate aperture. In *violacea* the coloration is constantly pink, the form is more conical, the whorls more tightly coiled, and in consequence the aperture is smaller and approximately circular. Both species have the columellar callus deeply excavated in the middle. Examples from deep water (Sts. WS 824, WS 829 and WS 838) are pure white.

I have not seen *Photinula solidula* Cooper & Preston (1910, p. 111, pl. 4, fig. 3), Falkland Islands, which is most likely a synonym of *violacea*.

Margarella steineni (Strebel)

Margarita (*Photinula*) *expansa* Martens & Pfeffer (*non* Sowerby), 1886, pl. 2, figs. 10*a*, *c*.
Photinula steineni Strebel, 1905, p. 158, pl. 5, figs. 16*a–d*.
Photinula steineni Strebel, 1908, p. 73.
Margarella steineni L. David, 1934, p. 127.

TYPE LOCALITY. South Georgia.

St. 141. East Cumberland Bay, South Georgia, 200 yards from shore, 29 Dec. 1926, 17–27 m.
St. 145. Stromness Harbour, South Georgia, 7 Jan. 1927, 26–35 m.
St. WS 25. Undine Harbour (North), South Georgia, 17 Dec. 1926, 18–27 m.

RANGE. South Georgia, 0–35 m.

A small, pale cream-coloured shell, pearly externally, and greenish iridescent inside the aperture.

Margarella jason n.sp., Pl. V, fig. 1

A pale cream, pearly shell with pale iridescent interior to the aperture. Whorls four, rapidly increasing. Spire half height of aperture, suture plain, tangential to slightly adpressed over last half-whorl. Columella lip broad, slightly concave, rapidly contracted below to the thin-edged basal outer lip. Outer edge of columellar callus sharp, outwardly curved and partly encroaching upon a crescentic umbilicus, which is incised with four concentric narrow grooves. Operculum normal, horny, with a central nucleus.

This new species resembles *antarctica* (Lamy, 1905), but differs in reaching only half the linear dimensions, in having a much smaller umbilicus, incised with grooves, a broadly expanded columellar callus and more rapidly increasing whorls. Both species have the whorls rather narrowly rounded at the periphery.

Major diameter 6·0 mm.; minimum diameter 5·0 mm.; height 4·5 mm. (holotype).

TYPE LOCALITY. St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, 238-270 m.

This species is almost certainly a benthic relative of Strebel's *Margarita subantarctica* (1908, p. 76). Strebel's species is based upon juveniles (1·4 × 1·2 mm.) from low water, Cumberland Bay, South Georgia. The smooth unicoloured *Margarella* forms are difficult enough to separate even as adults. It is possible that when fully grown littoral shells are found, my *jason* n.sp. may prove to be a synonym of *subantarctica*, but, on the other hand, it is unlikely that shells from such different habitats will be identical. Thiele (1912, p. 258) included *subantarctica* in the synonymy of *antarctica*. For the present Strebel's species is best considered indeterminate.

Margarella bouvetia n.sp., Pl. V, fig. 3

Shell small, white, with a faint iridescence. Turbinate, thin, of 4½ rounded whorls. Spire three-fifths height of aperture. Suture impressed, not margined. Columellar callus moderately wide medially, rapidly contracted below to the thin-edged basal outer lip, and above, partly bridging a deep open umbilicus. Umbilicus about one-tenth major diameter of shell, sculptured between the outer area of the umbilicus and the base with nine deeply incised spiral grooves. Eight of these grooves are closely spaced, but the outermost is double-spaced. The rest of the shell is smooth, except for weak, distant, irregular, axial growth lines which become concentrated within the umbilicus. Operculum horny with a central nucleus.

DENTITION. Fig. G, 8, p. 189.

Major diameter 8·4 mm.; minimum diameter 7·0 mm.; height 7·5 mm. (holotype).
Major diameter 9·0 mm.; minimum diameter 7·8 mm.; height 8·0 mm. (largest).

TYPE LOCALITY. St. 456. 1 mile east of Bouvet I. 18 Oct. 1930, 40–45 m.

The species resembles *M. refulgens* Smith (1907) (*Valvatella*), from McMurdo Sound, 10–130 fathoms. Smith's species, however, is much smaller (5 × 5 mm.) and lacks the spiral grooves surrounding the umbilicus.

Margarella porcellana n.sp., Pl. V, fig. 2

Shell small, uniformly white, polished and faintly iridescent within the aperture. Whorls $4\frac{1}{2}$, relatively slowly increasing, broadly convex above and more narrowly convex at lower third of whorl height. Spire five-sixths the height of the aperture. Suture adpressed throughout, giving the appearance of a narrow submargining. Columellar callus broad with a sharply defined edge, concave and completely covering the umbilical area. The species is close to *steineni*, but differs in having a higher spire and adpressed false-margined sutures. Also, it lacks the pearly appearance of the exterior and the intense iridescence of the interior, which features are so characteristic of *steineni*.

Major diameter 8·0 mm.; minimum diameter 7·0 mm.; height 7 mm. (holotype).

Major diameter 8·5 mm.; minimum diameter 6·7 mm.; height 6·5 mm. (*steineni*, St. 145).

TYPE LOCALITY.

St. 1562. Off Marion I., 46° 51·7′ S, 37° 56·5′ E to 46° 54·8′ S, 37° 53·8′ E, 7 Apr. 1935, 97–104 m.
St. 1564. Off Marion I., 46° 36·5′ S, 38° 02·3′ E, 7 Apr. 1935, 108-113 m.
St. 1563. Off Marion I., 46° 48·4′ S, 37° 49·2′ E, 7 Apr. 1935, 113–99 m.

Margarella antarctica (Lamy)

Margarita antarctica Lamy, 1905, p. 481.
Margarita antarctica Lamy, 1907, p. 9, pl. 1, figs. 2, 3, 4.
Valvatella antarctica Melvill & Standen, 1907, p. 99.
Valvatella antarctica Lamy, 1911*a*, p. 13.

DENTITION. Fig. G, 9, p. 189.

TYPE LOCALITY. South Orkney Is.

St. 164. East end of Normanna Strait, South Orkneys, near Cape Hansen, Coronation Is., 18 Feb. 1927, 24–36 m.
St. 179. Melchior I., Schollaert Channel, Palmer Archipelago, 10 Mar. 1927, 4–10 m.
St. 1486. Harmony Cove, Nelson I., South Shetlands, 3 Jan. 1935, shore coll.
Wilhelmina Bay, Danco Land, South Shetlands, 64° 30′ S, 62° W, 1–8 fathoms (A. G. Bennett).

RANGE. Palmer Archipelago ('Discovery'), Wandel I. and Moureau I. (Thiele, 1912), Petermann I. (Lamy, 1911), South Orkneys (Lamy, 1905) and South Shetlands ('Discovery').

Subgenus **Promargarita** Strebel, 1908

Type (monotypy): *Promargarita tropidophoroides* Strebel

The genotype appears strikingly different from typical *Margarella* which has a smooth surface and rounded whorls. Strebel's *Promargarita tropidophoroides* is biangulated by two heavy spiral keels, and the entire surface is deeply incised with closely spaced spiral grooves. It is pointed out below, however, that *achilles* Strebel has incised spiral sculpture both on the early whorls and surrounding the umbilical area, but the rest of the shell is smooth. My new subspecies *obsoleta* has uniformly developed incised spirals over the whole shell, but it is only weakly biangulate as also is *achilles*. All three are uniformly brownish except for a white zone around the umbilical area and one or two narrow white bands in place of the keels where these have been reduced to subangles.

The radulae of both *tropidophoroides* and *achilles* show no essential differences from that of *Margarella*.

Strebel's *Promargarita* is retained as a subgenus, since it expresses a localized spirally sculptured trend in a genus that normally has smooth polished shells.

argarella (Promargarita) tropidophoroides (Strebel)

Promargarita tropidophoroides Strebel, 1908, p. 74, pl. 5, fig. 73*a–d*.
Promargarita tropidophoroides Thiele, 1912, pl. 15, fig. 17 (radula).
Margarella (*Promargarita*) *tropidophoroides* L. David, 1934, p. 127.

DENTITION. Fig. G, 4, p. 189.

TYPE LOCALITY. South Georgia, 20 m.

St. 1941. Leith Harbour, South Georgia, 29 Dec. 1936, 55–22 m.
St. MS 6. East Cumberland Bay, ¼ mile south of Hope Point to 1¼ cables S × E of King Edward Lt., South Georgia, 12 Feb. 1925, 24–30 m.
St. MS 10. East Cumberland Bay, ¼ mile south-east of Hope Point to ¼ mile south of Government Flagstaff, South Georgia, 14 Feb. 1925, 26–18 m.
St. MS 67. East Cumberland Bay, 3 cables north-east of Hobart Rock to ½ cable west of Hope Point, South Georgia, 28 Feb. 1926, 38 m.
St. WS 25. Undine Harbour (North), South Georgia, 17 Dec. 1926, 18–27 m.

Major diameter 14·2 mm.; minimum diameter 11·5 mm.; height 11·7 mm. (St. MS 67).
Major diameter 17·5 mm.; minimum diameter 14·5 mm.; height 14·0 mm. (St. MS 10).

argarella (Promargarita) tropidophoroides obsoleta n.subsp., Pl. V, fig. 4

This is a form of *tropidophoroides* with the spiral keels reduced to a weak biangulation.

Shell thin, depressed-turbinate, very weakly biangulate, imperforate, pale yellowish brown with white zone surrounding the umbilical area and occasionally a narrow white band at the lower subngle. Spire half height of aperture. Uniformly sculptured with numerous deeply incised spiral lines. horls five, broadly rounded, but weakly angulate above the middle on the spire-whorls, and at the eriphery. The spirals number seven on the first post-nuclear whorl, fifteen to twenty on the penultiate and about forty-five on the body-whorl. The columellar callus is white, broad, concave and ompletely fills the umbilical area. Compared with *achilles* of similar size, *obsoleta* has a taller spire, more rounded aperture, is of lighter colour and has evenly developed spirals over the whole shell.

Major diameter 13·5 mm.; minimum diameter 11·0 mm.; height 11·0 mm. (St. MS 6).

TYPE LOCALITY. St. MS 6. East Cumberland Bay, ¼ mile south of Hope Point to 1¼ cables S × E f King Edward Point Lt., South Georgia, 12 Feb. 1925, 24–30 m.

argarella (Promargarita) achilles (Strebel)

Photinula achilles Strebel, 1908, p. 73, pl. 5, fig. 69*a*, *b*.

TYPE LOCALITY. South Georgia, 1–2 m.

St. 145. Stromness Harbour, South Georgia, between Grass I. and Tonsberg Point, 7 Jan. 1927, 26–35 m.
St. MS 6. East Cumberland Bay, ¼ mile south of Hope Point to 1¼ cables S × E of King Edward Point Lt., South Georgia, 12 Feb. 1925, 24–30 m.
St. WS 25. Undine Harbour (north), South Georgia, 17 Dec. 1926, 18–27 m.

This is a large, thin-shelled species, depressed-turbinate, with a relatively large ovate aperture. It is ght reddish brown with a broad zone of white surrounding the umbilical area, occasionally a narrow hite band just below the periphery and rarely a second narrow white band above the periphery. The ody-whorl is weakly biangulate. Sculpture consisting of incised lines, clearly shown on the early horls and around the umbilical area, but obsolete elsewhere. In the adult there are about eight rations on the early whorls and six or seven around the umbilical area. The umbilicus is completely overed by a broad concave white columellar callus. Strebel compares this species with *expansa*, but he relationship is certainly with *Promargarita tropidophoroides*.

Major diameter 19·0 mm.; minimum diameter 16·2 mm.; height 16·5 mm. (St. WS 25).

DENTITION. The radula is scarcely distinguishable from that of *tropidophoroides*.

Genus **Submargarita** Strebel, 1908

Type (monotypy): *Submargarita impervia* Strebel

Submargarita impervia Strebel

Submargarita impervia Strebel, 1908, p. 75, pl. 5, fig. 71 *a–c*.
Submargarita impervia Thiele, 1912, p. 188, pl. 15, fig. 18 (radula).

DENTITION. Fig. G, 10, p. 189.

TYPE LOCALITY. Cumberland Bay, 252–310 m., South Georgia.

St. 27. West Cumberland Bay, 3·3 miles 44° E of Jason Lt., South Georgia, 15 Mar. 1926, 110 m. (one example).

Genus **Antimargarita** n.g.

Type: *Valvatella dulcis* Smith

This is provided for thin-shelled, colourless, elaborately sculptured depressed-turbinate species with a wide, deep, steep-sided umbilicus. The dentition (Eales, 1923, p. 7, fig. 4) resembles that of *Margarita* in the evenly arcuate sweep of the laterals and central, but individually these teeth are of very different shape.

The simple coiled shells of the Trochoids mask a diversity of internal structures in an ancient and primitive group. Thiele (1921, p. 68) has shown this in his valuable researches on the dentition.

On shells alone there would be every excuse for classing together such species as *Valvatella dulcis* Smith, *Margarita gemma* Smith and *Solariella kempi* n.sp. All three are thin-shelled, umbilicated, and elaborately sculptured with crisp spiral ridges and axial threads, but the dentition clearly indicates that not only are three genera required for their reception, but also they fall individually into three distinct subfamilies of the Trochacea.

The genus probably includes *Submargarita smithiana* Hedley (1916, p. 38, Pl. 5, fig. 58) from off Shackleton Ice-shelf, 65° 20′ S, 95° 27′ E, in 240 fathoms, and *Minolia thielei* Hedley (loc. cit.) from near Shackleton Ice-shelf, 64° 32′ S, 97° 20′ E in 110 fathoms.

Antimargarita dulcis (Smith)

Valvatella dulcis Smith, 1907, p. 10, pl. 11, fig. 8.
Margarites dulcis Thiele, 1912, p. 190, pl. 11, fig. 21.
Margarites dulcis Smith, 1915, p. 63.
Minolia dulcis Hedley, 1916, p. 38.
Margarites dulcis Eales, 1923, p. 6.

TYPE LOCALITY. Discovery Winter Quarters, McMurdo Sound, 77° 50′ 50″ S, 166° 44′ 45″ E, 130 fathoms.

St. 175. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.
St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

DENTITION. Fig. G, 5, p. 189 (after Eales, 1923).

RANGE. Ross Sea ('Discovery'), Adelie Land (Smith, 1907, 1915), Gauss Station (Thiele, 1912), South Shetlands ('Discovery'), 130–400 fathoms. The 'Discovery' records extend the range of this species to three-fourths of the circumference of Antarctica.

Antimargarita thielei (Hedley)

1916. *Minolia thielei* Hedley, *Aust. Antarct. Exped.* (ser. C), IV (1), Moll. p. 39, pl. 5, fig. 59.

TYPE LOCALITY. Near the Shackleton Ice-shelf, 64° 32′ S, 97° 20′ E, 110 fathoms.

St. 1652. Ross Sea, 75° 56′ 2″ S, 178° 35′ 5″ W, 23 Jan. 1936, 567 m.

The largest example from St. 1652 has 3½ whorls and is 3·8 mm. in diameter by 3·4 mm. in height. The type has four whorls and measures 8 × 7 mm.

Genus **Tropidomarga** n.g.

Type: *Tropidomarga biangulata* n.sp.

The type of this new genus bears a superficial resemblance to *Minolia*, but the dentition shows close liance with the boreal '*Pupillaria*' *cinerea* (Couthouy). Both differ from all other *Margarites*-like pecies (of which the dentition is known to me) in the form of the basal plates of the central and laterals. The central has a large circular base, and the laterals are similar except that they are cut away on the nner side.

The type of *Pupillaria* (*Trochus pupillus* Gould, California) is tall, conical, solid, angulate at the eriphery, narrowly umbilicate and sculptured with narrow spiral cords. The species *cinerea* (boreal) s relatively large and thin with a rounded periphery, surface sculptured with narrow, distinct, sharply aised spiral cords and has a deep narrowly open umbilicus about one-eight the major diameter of the base.

The type of *Margarites* (*Helix margarita* Montagu = *Turbo helicinus* Phipps) is depressed turbinate, mbilicate and smooth surfaced.

Although there is apparently a relationship between the antarctic *Tropidomarga* and the boreal *inerea*, the latter does not conform to the genotypes of either *Margarites* or *Pupillaria*, or any other vailable genus.

For the antarctic species described below, I propose therefore the new generic name *Tropidomarga*.

This new genus has a conical shell with strongly shouldered spire whorls and a prominently bingulate body-whorl. The surface is sculptured with thin spiral lirations crossed by finer dense axial hreads. At the suture the axials are thickened to form a crenulated submargining. The umbilicus is deep with straight-sided walls and has a width of about one-fifth that of the major diameter of the shell.

Tropidomarga biangulata n.sp., Pl. V, fig. 5

Shell of moderate size, depressed-conical, with prominently shouldered spire-whorls and biangulate body-whorl, broadly umbilicated and sculptured with numerous spiral lirations crossed by dense retractive axial threads. Whorls six, including a low rounded protoconch of one smooth whorl. First post-nuclear whorl with two spiral lirae, second with six, body-whorl with twelve lirations between the suture and upper angulation, nine between the upper and lower angulations (about fifteen, angulations ncluded) and about thirty on the base. They continue just over the edge of the umbilicus, but the remainder of the surface of the walls of the steep-sided umbilicus is plain. Umbilicus about one-fifth major diameter of the base. The suture is delicately crenulated by the axial threads. The angulations are broadly rounded and do not interrupt the sculpture.

Aperture rhomboidal, outer lip thin, strongly retractive in profile, inner lip inclined but moderately straight, slightly thickened medially and slightly encroaching upon the umbilicus, where it curves above and finally spreads as a very thin nacreous glaze over the parietal wall. This glaze is so thin that it does not obliterate the spiral sculpture. Colour buff to very light brown above, creamy white on the base and iridescent within the aperture. Operculum horny, thin, yellowish brown, circular and multispiral.

The biangulate whorls give the species a superficial resemblance to Strebel's *Promargarita tropidophoroides*.

Diameter 14·6 mm.; height 13·0 mm. (holotype).

Diameter 14·0 mm.; height 12·5 mm. (paratype).

Type locality. St. 159. North-east of Cumberland Bay, South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m.

Dentition. Fig. G, 6, p. 189. ∞+4+1+4+∞. Very similar to that of '*Margarita striata*' = *Pupillaria cinerea* Couth (Thiele, 1891, pl. 25, fig. 9) from Gulf of St Lawrence. Both have the central tooth with a circular base and laterals of the same form except that each is cut away on its inner side.

Thiele's drawing of the radula of '*striata*' shows a vestigial fifth lateral and a very weak innermost marginal. In *biangulata* there is no trace of a fifth lateral, and the innermost marginal is the largest of that series, but it is not disproportionately large as in the Calliostomids.

Animal. There are six pairs of epipodial tentacles—the sixth from the front long and slender, almost twice the length of the other five, which are of approximately equal size. Cephalic tentacles moderately long, blunt and flattened. Eye at the end of a short stalk, lying at the outer side of the base of each tentacle. The stalk is confluent with a short veil which crosses the base of a tentacle but does not join up with its opposite member across the head. Head narrow in front and produced into a wrinkled proboscis, with a frilled edge. Epipodial fringe continued to the area in front of the head in an elaborate series of folds.

Subfamily SOLARIELLINAE n.subfam.

This new subfamily is provided for the group of genera *Solariella*, *Machaeroplax* and *Cidarina*. The shells are conical, openly umbilicated, with a more or less circular simple aperture, and sculpture of spiral keels or ribs, usually crenulated or granulated below the suture and bordering the umbilicus.

The radula has an approximate formula of 10+5+1+5+10, the most distinctive feature being the small number of marginals. In all other Trochoid groups the marginals are so numerous and crowded that it is impossible to determine their exact number. Other distinctive radular features are the very pronounced dip to the centre of each row and the elongate shape of the two outer laterals which resemble the enlarged functional inner marginals of the Calliostomids.

Genus **Solariella** Searles Wood, 1842

Type (monotypy): *Solariella maculata* S. Wood

The genotype is from the English Pliocene and is a heavily carinated shell with prominent beading or crenulations both at the suture and on a ridge bounding the wide funnel-shaped umbilicus.

There is a group of subantarctic species, *Trochus* (*Margarita*) *brychius* Watson, from 900 miles south-east of Kerguelen Island in 900 fathoms, *T.* (*Margarita*) *charopus* Watson from off Kerguelen Island in 105 fathoms, var. *caeruleus* Watson from off Heard Island in 175 fathoms and the new species *kempi* described below. These have the general features of *Solariella*, but lack the sutural and umbilical crenulations.

The radula of *kempi* n.sp., however, is essentially similar to that of *varicosa* Mighels & Adams from Newfoundland to Nova Zembla as figured by Pilsbry (1889, pl. 50, fig. 17) and *biradiatula* Martens from Dar-es-Salam in 400 m. as figured by Martens & Thiele (1903, pl. 8, fig. 37; see Text-fig. G, 12). Both these species have crenulations, but the other shell characters are not very similar, neither are they to the Pliocene genotype nor to the subantarctic group mentioned above. This subantarctic group is for the present retained in *Solariella* pending a revision of the members of the subfamily.

Solariella kempi n.sp., Pl. I, fig. 6

Shell globosely conoidal, thin, sculptured with closely spaced, sharply raised, narrow, spiral cords and dense axial interstitial threads; widely umbilicate. Whorls $5\frac{3}{4}$, regularly increasing and including a minute apparently smooth helicoid protoconch of one whorl. First post-nuclear whorl with three wide-spaced, narrow, sharply raised, spiral cords, second with four, increasing to fifteen on the penultimate, by the addition of intermediate cords, and about sixty on the body whorl from the suture to the edge of the umbilical cavity; about thirty within the umbilicus. The whole surface is crowded with ne, crisp, retractively oblique radial threads which cross the spiral cords, rendering them minutely emmate. Whorls strongly convex, slightly flattened below the suture on the early whorls, but resolving to a slight subsutural concavity over the last whorl. Suture impressed to adpressed. Spire equal to eight of aperture. Umbilicus wide, perspective outwardly, one-third major diameter of the base but apidly contracted within to one-ninth the diameter of the base. Aperture circular, discontinuous, outer p thin; columellar lip slightly thickened and reflexed; parietal wall with a very thin glaze that does not bscure the sculpture. Colour pale pinkish buff, interior of the aperture faintly iridescent. Operculum rcular, thin, horny, yellowish brown, of about eight spirals.

Diameter 12·0 mm.; height 11·75 mm. (holotype).

TYPE LOCALITY. St. WS 766. Between Falkland Is. and Argentina, 45° 13′ S, 59° 56′ 30″ W, 8 Oct. 1931, 545 m.

St. WS 228. North-east of Falkland Is., 50° 50′ S, 56° 58′ W, 30 June 1928, 229–236 m.
St. WS 237. North of Falkland Is., 46° 00′ S, 60° 05′ W, 7 July 1928, 150 m.
St. WS 244. West of Falkland Is., 52° 00′ S, 62° 40′ W, 18 July 1928, 253 m.*
St. WS 869. Between Falkland Is. and Patagonia, 52° 15′ 30″ S, 64° 13′ 45″ W, 31 Mar. 1932, 187–0 m.

DENTITION. Fig. G, 11, p. 189. 10+5+1+5+10. The cusps on the first and second laterals are exceponally long. Lateral number 3 has a very broad base and numbers 4 and 5 are large, long and hooked, losely resembling in form the innermost enlarged marginals of the Calliostomids. In the figure only ne upper portions of numbers 4 and 5 are drawn, and they are shown in relation to the central and aterals 1–3, but from the row immediately below. The two outer laterals are actually superimposed pon numbers 2 and 3. The marginals are long, slender and curved.

ANIMAL. Head narrow behind but broad in front, with a deeply laciniated fringe overhanging the mall mouth. In front of the mouth there are folded laciniated lappets. Epipodial fringe with three lender tentacles, anterior one long, others reducing in size towards the head (Fig. D, 3).

Family LIOTIIDAE

Genus **Cirsonella** Angas, 1877

Type: *Cirsonella australis* Angas

irsonella extrema Thiele

Cirsonella extrema Thiele, 1912, p. 191, pl. 11, fig. 23.

TYPE LOCALITY. Gauss Station, Davis Sea.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 351 m. (one empty shell).

Genus **Brookula** Iredale, 1912

Type (o.d.): *Brookula stibarochila* Iredale, Kermadec Islands

The following four species are certainly congeneric and conform with the superficial features of *Brookula*. However, since the soft parts of these minute shells are unknown, the generic identity of hese antarctic and subantarctic species of the American Quadrant is provisional only.

Brookula calypso (Melvill & Standen)

Cyclostrema calypso Melvill & Standen, 1912, p. 345, pl. 1, fig. 3.

TYPE LOCALITY. Burdwood Bank, south of Falkland Is., 54° 25′ S, 57° 32′ W, 56 fathoms.

St. 51. Off Eddystone Rock, east of Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 115 m.

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* The single half-grown example from St. WS 244 is more definitely shouldered, but is otherwise typical.

Brookula pfefferi n.sp., Pl. V, fig. 8

Shell minute, solid, white, globose-turbinate, umbilicate, sculptured with crisp axial ribs and finer, closely spaced spiral threads. Whorls 4½, including a smooth, globular protoconch of one whorl. Spire equal to height of aperture. Aperture circular with complete simple peristome. Axial sculpture of crisp narrow radials becoming weaker over the base, about twenty-four on the penultimate. Spiral threads about 12 on the penultimate and twenty-four on the body whorl, plus four very much stronger broad flat-topped cords within the funnel-shaped umbilical cavity, which rapidly contracts to a small deep pit. Operculum horny, circular and multispiral.

Height 2·0 mm.; diameter 1·75 mm.

Type locality. St 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m. (the holotype only).

This species is closely allied to *calypso* Melvill & Standen (1912) which is smaller, 1 × 1·15 mm., and lacks the four strong umbilical spirals.

Brookula strebeli n.sp., Pl. V, fig. 7

Shell minute, white, elongate-turbinate, imperforate, sculptured with crisp axial ribs and spiral threads. Whorls 3¾, including a smooth, globular protoconch of one whorl. Spire slightly taller than height of aperture. Aperture circular with complete simple peristome. Axial sculpture of prominent rounded radials becoming weaker over the base, about twenty-three on the penultimate. Spiral sculpture consisting of six moderately strong lirations on the upper spire-whorls and about sixteen on the body-whorl; they continue strongly for a short distance over the periphery and then suddenly diminish to minute, closely spaced threads, too indistinct to count, and finally there are four stronger spirals around the closed umbilical area.

Height 1·5 mm.; diameter 1·25 mm.

Type locality. St. 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m. (the holotype only).

This species is smaller than *pfefferi*, taller, imperforate and differently sculptured.

The names of Pfeffer and Strebel are associated with the two above new species in recognition of their respective major contributions on South Georgian molluscan systematics.

Brookula decussata (Pelseneer)

Cyclostrema decussatum Pelseneer, 1903, pl. 5, fig. 48.

Type locality. Bellingshausen Sea, 70° S, 80° 48′ W.

St. 182. Schollaert Channel, Palmer Archipelago, 64° 21′ S, 62° 58′ W, 14 Mar. 1927, 278–500 m.

The specimens from St. 182 seem to be identical with Pelseneer's species as far as I can judge from the rather sketchy illustration. They are very similar to *pfefferi*, but are smaller and have crisp, more definite sculpture with more numerous axials but fewer spirals.

Family TURBINIDAE

Genus **Homalopoma** Carpenter, 1864

Type (monotypy): *Turbo sanguineus* Linn. = *Leptothyra* Dall, 1871 (*non* Pease 1869)

Homalopoma cunninghami Smith

Collonia cunninghami Smith, 1881, p. 33, pl. 4, fig. 10.

Leptothyra cunninghami Pilsbry, 1888, p. 249.

TYPE LOCALITY. Port Rosario and Portland Bay, Patagonia.

St. 1321. From 4 miles S 72° W to 5·6 miles S 75° W of East Tussac Rock, Cockburn Channel, Tierra del Fuego, 16 Mar. 1934, 66 m.

One example of this attractive little rose-coloured, finely striated species; diameter 4·75 mm., ight 4·0 mm. The operculum is calcareous and spirally grooved on its outer surface for 1½ whorls, closing a roughened central area.

I have followed Vokes (1939, p. 179) in preferring *Homalopoma* to the better known name *Leptothyra*.

Genus Leptocollonia n.g.

Type: *Leptocollonia thielei* n.sp.

This new genus is provided for a southern group of *Homalopoma*-like (*Leptothyra*) shells which differ being umbilicate, relatively thin-shelled, colourless, and in having a distinctive operculum, which is ncave externally and deeply spirally channelled. The radula of *Leptocollonia* is very similar to that of *omalopoma*, the chief difference being in the marginals, which are plain in the former and serrated in e latter.

Thiele's *Leptothyra innocens* (1912, p. 192, pl. 11, fig. 24) from Gauss Station, Antarctic, is a *Lepto- lonia*, and the operculum of *Leptothyra* sp. (Thiele, loc. cit.), also from Gauss Station, is so similar that of *thielei* n.sp. that it probably originated from this same species.

ptocollonia thielei n.sp., Pl. V, fig. 9

Shell small, depressed-turbinate, perforate, dull yellowish buff, sculptured with narrow prominently sed spiral ridges. Whorls rounded, four, including the protoconch which is apparently one slightly nvex and smooth whorl (protoconch eroded in all examples). First post-nuclear whorl with two spiral ges, penultimate with from six to eight (seven plus an incipient eighth in holotype), body-whorl with een, last two bordering the umbilicus, weak. The spirals are rounded but narrow and prominently sed with interspaces of from three to four times their width. The whole surface is crowded with licate axial growth striae. Umbilicus narrow and deep, about one-ninth the major diameter, but lf-obscured by the thin reflexed outer edge of the columellar callus. Peristome continued across the rietal wall by a thin glaze. Outer-basal lip thin and corrugated by the terminal points of the external ral sculpture. The operculum is calcareous and multispiral of about seven whorls. Externally dull ite, concave and deeply spirally channelled. Internally smooth and convex with a yellowish chitinous er. The edge is thick, bevelled, with a median groove.

Diameter 9·0 mm.; height 7·5 mm. (holotype).

DENTITION. Fig. G, 13, p. 189. The radulae of these small Turbinids are most difficult to interpret account of the minute size of the teeth and the complicated manner in which the bases overlap. My nclusions were made prior to reference to the results arrived at by Troschel & Thiele (1878, p. 213, 22, fig. 7) and Tryon & Pilsbry (1888, pl. 60, fig. 73). The *Leptocollonia thielei* radula (Fig. G, 13) ows a marked resemblance to Pilsbry's figure of that of *Homalopoma carpenteri* (Fig. G, 14), and is nost totally at variance with Troschel and Thiele's interpretation based upon '*coccineus* Deshayes', e same species. The 'double-decked' appearance of the central tooth is not paralleled in any other own group. In both *Homalopoma* and *Leptocollonia* this tooth has a projecting plate above as well as ow, and lateral wings form a broad arc across the median area. The central appears to be functions, for it bears no cusps, just an irregular thickening at the crest of the median arc. The laterals, five number, are long, excavated on the inner side to accommodate the lateral wings of the central, and oduced on the outer side. These features are well developed in four of the laterals, but not in the fifth.

TYPE LOCALITY. St. 153. Off Cumberland Bay, South Georgia, 54° 08′ 30″ S, 36° 27′ 30″ W, 17 Jan. 1927, 106 m.

St. 20. 14·6 miles N 41° E of Cape Saunders, South Georgia, 4 Mar. 1926, 200 m.
St. 42. Off mouth of Cumberland Bay, South Georgia, 1 Apr. 1926, 120–204 m.
St. 140. Stromness Harbour to Larsen Point, South Georgia, 23 Dec. 1926, 122–136 m.
St. 156. North of South Georgia 53° 51′ S, 36° 21′ 30″ W, 20 Jan. 1927, 200–236 m.
St. 190. Bismarck Strait, Palmer Archipelago, 24 Mar. 1927, 315 m.

Family LITTORINIDAE

Study of the radulae of the southern Laevilitorinids indicates a greater complexity than is suggested by their respective shells. Four genera have been in use—*Laevilitorina*, *Pellilitorina*, *Haloconcha* and *Macquariella*. The first, second and fourth names were proposed for antarctic-subantarctic shells, but the genotype of the third is northern and is based upon a little known and apparently quite local species from the Aleutian Islands.

Two main radula types are found in the southern shells: (*a*) with a broad, shallow-based central tooth bearing five cusps, and (*b*) with a narrow, deep-based central tooth, variously cusped. Type (*a*) is restricted to *Pellilitorina* and type (*b*) to the remainder. Type (*b*), however, subdivides into (*b*1) with prominent, narrowly pointed cusps on both the central and lateral teeth, and (*b*2) with very broad chisel-shaped cusps. Type (*a*) is found in relatively large, globose shells with only a narrow umbilical perforation and an epidermis covered with hair-like processes. Type (*b*1) is found in *Laevilitorina*, which is small, ovate-conical and imperforate, and in *Macquariella*, which is small, subglobose and narrowly umbilicate. Type (*b*2) is found in *Lacuna antarctica* Martens, 1885, which Thiele (1912) referred to *Haloconcha*; *Pellilitorina bransfieldensis* Preston, 1916, which is almost identical with *antarctica*; *Pellilitorina bennetti* Preston, 1916; and *Laevilitorina coriacea* Melvill & Standen, 1907.

The type (*b*2) group, however, present three distinct shell types: (1) *antarctica* and *bransfieldensis*, which have a broad, depressed, heliciform shell with a wide umbilicus; (2) *bennetti*, which is globose and narrowly umbilicated; and (3) *coriacea*, which is ovate-conical and imperforate and of identical shape to *Laevilitorina*.

Several new names are required to arrange these shells in a natural grouping and they are diagnosed as follows:

Genus *Laevilitorina* Pfeffer, 1886 (Type: *Hydrobia caliginosa* Gould). Tierra del Fuego to Macquarie Island. Shell small, ovate conical, imperforate or almost so, epidermis smooth. Radula (Fig. I, 26) with a narrow central tooth, central and laterals with several prominent, narrowly pointed cusps, marginals fan-shaped and multidenticulate. Includes *pygmaea*, *venusta*, *granum* and *umbilicata* Pfeffer, 1886, South Georgia, *bennetti* and *latior* Preston, 1912, Falklands and probably *claviformis* Preston.

Subgenus *Corneolitorina* n.subg. (of *Laevilitorina*) (Type: *L. coriacea*, Melvill & Standen), South Orkneys. Shell small, ovate-conical, imperforate, as in *Laevilitorina*, but scarcely any shell substance apart from a thick leathery epidermis. Radula (Fig. I, 27) with a narrow central tooth, central and laterals with the main cusps blunt, chisel-shaped, marginals narrow with about seven denticles. Pelseneer's *L. elongata* (1903, pl. 5, fig. 58) from Two Hummocks Islands may belong here also.

Genus *Macquariella* Finlay, 1926 (Type *Paludestrina hamiltoni* Smith) Macquarie Island. Shell small, subglobose and narrowly umbilicated. Radula (Fig. I, 31) with an extremely narrow central tooth bearing only one long, sharp cusp, first lateral with a long central cusp and two shorter cusps, second lateral with three long cusps, marginals multidentate. Includes *Macquariella aucklandica* Powell, 1933, from Auckland, Chatham and Stewart Islands, New Zealand.

Genus *Laevilacunaria* n.g. (Type: *Pellilotorina bransfieldensis* Preston), South Shetlands. Shell rger than that of *Laevilitorina*, depressed, heliciform with a wide umbilicus and smooth epidermis. adula (Fig. I, 29) with a narrow central tooth, central and lateral teeth with broad chisel-shaped main usps and weak side denticles, marginals foliate with few denticles. Includes *Lacuna antarctica* artens from South Georgia and possibly *Hydrobia pumilis* Smith from Swains Bay, Kerguelen sland.

Since these southern Littorinids vary in shape between ovate-conical and depressed helicoid forms, ven within one radula group, the use of the northern genus name *Haloconcha* for this group, merely pon external resemblances, is undesirable. Until some knowledge of the animal of *Haloconcha* is vailable it is more satisfactory to disassociate the southern shells under a new generic name.

Subgenus *Pellilacunella* n.subg. (of *Laevilacunaria*) (Type: *Pellilitorina bennetti* Preston), South hetlands. Shell larger than that of *Laevilitorina*, globose, narrowly umbilicated and with a smooth pidermis. The radula (Fig. I, 30) resembles that of *Laevilacunaria*, except that the broad chisel-haped cusps are denticulated along their cutting edges.

Genus *Pellilitorina* Pfeffer, 1886 (Type: *Littorina setosa* Smith), Kerguelen Island, South Georgia nd South Orkneys. Shell relatively large, globose, narrowly umbilicated; epidermis set with hair-like rocesses. Radula (Fig. I, 32) with a broad shallow-based central tooth, bearing five cusps, the middle ne strongest, laterals with three strong cusps, marginals foliated and with several denticles.

Genus **Laevilitorina** Pfeffer, 1886

Type (Suter, 1913): *Hydrobia caliginosa* Gould

aevilitorina caliginosa (Gould)

Littorina caliginosa Gould, 1848, p. 83.
Hydrobia caliginosa Smith, 1879, p. 173, pl. 9, fig. 8.
Laevilitorina caliginosa Martens & Pfeffer, 1886, p. 81, pl. 1, fig. 8*a–d*.
Laevilitorina caliginosa Tryon, 1887, p. 254, pl. 46, fig. 29.
Laevilitorina caliginosa Pelseneer, 1903, p. 8.
Laevilitorina caliginosa Lamy, 1906*a*, p. 112.
Littorina (*Laevilitorina*) *caliginosa* Melvill & Standen, 1907, p. 100.
Laevilitorina caliginosa Strebel, 1908, p. 50.
Laevilitorina caliginosa Lamy, 1911*a*, p. 8.
Laevilitorina caliginosa Thiele, 1912, p. 235.
Littorina (*Laevilitorina*) *caliginosa* Melvill & Standen, 1912, p. 348.
Laevilitorina caliginosa Melvill & Standen, 1914, p. 118.
Laevilitorina caliginosa Hedley, 1916, p. 45.
Laevilitorina caliginosa var. L. David, 1934, fig. 1*a–d*.

DENTITION. Fig. I, 26.

TYPE LOCALITY. Royal Sound, Kerguelen I. (Suter, 1913)

St. 122. Maiviken, West Cumberland Bay, South Georgia, 14 Dec. 1926, 0–1 m.
St. MS 70. Maiviken, West Cumberland Bay, South Georgia, 9 Mar. 1926, shore coll.
St. WS 564. Moltke Harbour, South Georgia, 21 Feb. 1931, shore coll.

RANGE. Kerguelen I. (Gould, 1849; Smith, 1879; Thiele, 1912), Macquarie I. (Suter, 1913; edley, 1916), South Georgia (Pfeffer, 1886; Strebel, 1908; David, 1934), South Orkneys (Lamy, 1906*a*), outh Shetlands (Lamy, 1911*a*), Falkland Is. (Melvill & Standen, 1907, 1912; Strebel, 1908), Tierra del uego (Tryon, 1887).

In all probability more than one species is covered in the above locality records. It may be noted hat Strebel (1908) proposed *Laevilitorina caliginosa aestualis* for a shell from Port Louis, Falkland slands, noting that it was only half as large as the South Georgia form. Also Macquarie Island shells are very thin, never more than 4 mm. in height and show a narrow umbilical cleft, while those from South Georgia are more solid, from 6 to 8 mm. in height, and have a spreading parietal callus without a definite umbilical cleft. A range of topotypes will be required before anything further can be done.

Laevilitorina claviformis Preston

Laevilitorina claviformis Preston, 1916, p. 270, pl. 13, fig. 3.

TYPE LOCALITY. Deception Harbour, South Shetlands, on rocks at low water.

St. 179. Melchior I., Schollaert Channel, Palmer Archipelago, in creek to south of south-west anchorage, 10 Mar. 1927, 4–10 m.

Subgenus **Corneolitorina** n.subg.

Type: *Laevilitorina coriacea* Melvill & Standen

(See above for diagnosis)

Laevilitorina (Corneolitorina) coriacea Melvill & Standen

Littorina (*Laevilitorina*) *coriacea* Melvill & Standen, 1907, p. 130, pl. , fig. 2.

TYPE LOCALITY. Scotia Bay, South Orkneys, 5–10 fathoms.

St. 166. South-east point of Paul Harbour, Signy I., South Orkneys, 19 Feb. 1927, shore coll.

DENTITION. Fig. I, 27, p. 191 (St. 166).

Pelseneer's *Laevilitorina elongata* (1903, pl. 5, fig. 58) from Two Hummocks Islands appears to be closely allied.

Genus **Laevilacunaria** n.g.

Type: *Pellilitorina bransfieldensis* Preston

(See above for diagnosis)

Laevilacunaria bransfieldensis (Preston)

Pellilitorina bransfieldensis Preston, 1916, p. 271, pl. 13, fig. 5.

TYPE LOCALITY. From stomachs of fish taken in Bransfield Straits, off Deception I., South Shetlands.

St. 1486. Harmony Cove, Nelson I., South Shetlands, 3 Jan. 1935, shore coll.
Wilhelmina Bay, Danco Land, South Shetlands, 64° 30′ S, 62° W, 1–8 fathoms (A. G. Bennett).

Preston failed to recognize in the above species a very close relative of the South Georgian species described by Martens (1885, p. 92) as *Lacuna antarctica*. This species was admirably figured by Martens & Pfeffer (1886, pl. 2, fig. 1*a–f* and pl. 3, fig. 13), and on external characters there seems to be no obvious differences between figures of the South Georgian shell and actual paratypes of Preston's species. The radula of Preston's species, however, shows sufficient differences from that figured by Martens and Pfeffer for the South Georgian *antarctica*, to warrant recognition of both names for the present.

DENTITION. Fig. I, 29, p. 191. The radula in these shells is remarkable in having very broad chisel-shaped cusps on both the central and lateral teeth. In detail the central tooth of *bransfieldensis* differs from that of *antarctica* in being widest at the top, not medially, and in the cusp occupying most of the width of that tooth, not half the width as shown in Martens and Pfeffer's figure. In *bransfieldensis* both laterals have broad cusps with a small denticle on each side. In *antarctica*, however, the second lateral is shown with a reduced, chisel-shaped main cusp and two strong, pointed cusps on the inner side. These differences would seem greater than one can ascribe to either normal range of variation or to vagaries in interpretation.

A radula very similar to that of *bransfieldensis* is figured by Thiele (1929, p. 123) for *Carinolacuna carinifera* A. Adams from Borneo.

Subgenus **Pellilacunella** n.subg.

Type: *Pellilitorina bennetti* Preston

(See above for diagnosis)

aevilacunaria (Pellilacunella) bennetti (Preston)

Pellilitorina bennetti Preston, 1916, p. 270, pl. 13, fig. 4.

Type locality. Bransfield Strait, South Shetlands, on seaweed, 15 fathoms.

St. 179. Melchior I., Schollaert Channel, Palmer Archipelago, in creek to south of south-west anchorage, 10 Mar. 1927, 4–10 m.

Height 2·0 mm.; diameter 2·0 mm. (holotype).
Height 5·4 mm.; diameter 5·0 mm. (St. 179).
Height 6·0 mm.; diameter 5·0 mm. (St. 179).

Dentition. Fig. I, 30, p. 191 (St. 179).

The 'Discovery' shells attain a much larger size than Preston's holotype, but are assumed to be the ult of the species. The diagrams show an adult (Fig. M, 101) and a juvenile (Fig. M, 100) compared ith a tracing of Preston's holotype (Fig. M, 99, p. 195).

Genus **Pellilitorina** Pfeffer, 1886

Type (Thiele, 1929): *Littorina setosa* Smith

ellitorina setosa (Smith)

Littorina setosa Smith, 1875, p. 69.
Littorina setosa Smith, 1879, p. 172, pl. 9, fig. 6.
Pellilitorina setosa Martens & Pfeffer, 1886, p. 77, pl. 1, fig. 7*a*, *b*.
Littorina (*Pellilitorina*) *setosa* Smith 1902*b*, p. 204.
Littorina (*Pellilitorina*) *setosa* Melvill & Standen, 1907, p. 101.
Pellitorina (sic) *setosa* Strebel, 1908, p. 50.
Pellilitorina setosa Thiele, 1912, p. 235.
Pellilitorina setosa L. David, 1934, p. 127.

Dentition. Fig. I, 32, p. 191.

Type locality. Swain's Bay, 3–4 fathoms, Kerguelen Island.

St. 145. Stromness Harbour, South Georgia, between Grass I. and Tonsberg Point, 7 Jan. 1927, 26–35 m.
St. 456. 1 mile east of Bouvet I., 18 Oct. 1930, 40–45 m.
St. 1941. Leith Harbour, South Georgia, 29 Dec. 1931, 55–22 m. (one empty shell).
St. MS 10. East Cumberland Bay, ¼ mile south-east of Hope Point, to ¼ mile south of Government Flagstaff, South Georgia, 14 Feb. 1925, 26–18 m.
St. MS 71. East Cumberland Bay, 9¼ cables E × S to 1·2 miles E × S of Sappho Point, South Georgia, 9 Mar. 1926, 110–60 m.
St. WS 25 Undine Harbour (north), South Georgia, 17 Dec. 1926, 18–27 m.

Range. Kerguelen I.; Bouvet I. and Cape Adare (Smith, 1902); South Georgia (Pfeffer, Strebel and David) and South Orkneys (Melvill & Standen).

ellilitorina pellita (Martens)

Littorina pellita Martens, 1885, p. 92.
Pellilitorina pellita Martens & Pfeffer, 1886, p. 79, pl. 1, fig. 6*a–c*.
Littorina (*Pellilitorina*) *pellita* Smith, 1902*b*, p. 204.
Littorina (*Pellilitorina*) *pellita* Melvill & Standen, 1907, p. 101.
Pellitorina (sic) *pellita* Strebel, 1908, p. 50.
Littorina (*Pellilitorina*) *pellita* Melvill & Standen, 1912, p. 348.
Pellilitorina pellita L. David, 1934, p. 127.

DENTITION. Fig. I, 33, p. 191.

TYPE LOCALITY. South Georgia.

St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, 238–270 m. (eroded dead shells).
St. 164. North of Normanna Strait, South Orkneys, near Cape Hansen, Coronation I., 18 Feb. 1927, 24–36 m.
Uruguay Bay, Laurie I., 3 Jan. 1933, 16 m., from weed on anchor.

Family RISSOIDAE

Genus **Ovirissoa** Hedley, 1916

Type (o.d.): *Rissoa adarensis* Smith

Ovirissoa georgiana (Pfeffer)

Rissoa georgiana Pfeffer, 1886, p. 92, pl. 2, fig. 3.
Rissoa georgiana Strebel, 1908, p. 54.
Ovirissoa georgiana Hedley, 1916, p. 47.

TYPE LOCALITY. South Georgia.

St. 28. West Cumberland Bay, South Georgia, 3·3 miles S 45° W of Jason Lt., 16 Mar. 1926, 168 m.
St. WS 25. Undine Harbour (north), South Georgia, 17 Dec. 1926, 18–27 m.

Genus **Subonoba** Iredale, 1915

Type (o.d.): *Rissoa fumata* Suter.

Subonoba cf. **paucilirata** (Melvill & Standen)

Rissoa (*Onoba*) *paucilirata* Melvill & Standen, 1912, p. 350, pl. 1, fig. 10.

TYPE LOCALITY. Burdwood Bank, 56 fathoms.

St. 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m.

Subonoba fraudulenta (Smith, 1907)

Rissoa fraudulenta Smith, 1907, p. 9, pl. 2, fig. 3.
Rissoa fraudulenta Melvill & Standen, 1907, p. 103.
Rissoa fraudulenta Hedley, 1911, p. 5.
Rissoa fraudulenta Thiele, 1912, p. 194.

TYPE LOCALITY. McMurdo Sound.

St. 164. East end of Normanna Strait, South Orkneys, near Cape Hansen, Coronation I., 18 Feb. 1927, 24–36 m.

RANGE. Scotia Bay, South Orkneys, 6 fathoms (Melvill & Standen); Gauss Station (Thiele); McMurdo Sound, 10–20 fathoms (Hedley); Macquarie I. 69 m. (Tomlin, 1948).

Genus **Eatoniella** Dall, 1876

Eatonia Smith, 1875 *non* Hall, 1857

Type (o.d.): *Eatonia kerguelenensis* Smith

Eatoniella kerguelenensis major Strebel

Eatoniella kerguelenensis forma *major* Strebel, 1908, p. 57, pl. 4, fig. 56*a–c*.
Eatoniella kerguelenensis major Melvill & Standen, 1912, p. 351.

TYPE LOCALITY. Cumberland Bay, South Georgia, low tide.

St. 163. Paul Harbour, Signy I., South Orkneys, 17 Feb. 1927, 18–27 m.

RANGE. Recorded also from Scotia Bay, South Orkneys, 9–10 fathoms (Melvill & Standen, 1912); south-west of Snow Hill I., 64° 36′ S, 57° 42′ W, 125 m.; South Georgia, 22 m.; Astrolabe I., 63° 9′ S, 58° 17′ W, 95 m. (Strebel, 1908).

Family TROCHACLIDIDAE

Genus **Trochaclis** Thiele, 1912

Type (monotypy): *Trochaclis antarctica* Thiele

Trochaclis antarctica Thiele

Trochaclis antarctica Thiele, 1912, p. 192, pl. 11, fig. 29.
Trochaclis antarctica Hedley, 1916, p. 51.

TYPE LOCALITY. Gauss Station.

St. 1652. Ross Sea, 75° 56′ 2″ S, 178° 35′ 5″ W, 23 Jan. 1936, 567 m.
St. 1658. Off Franklin I., Ross Sea, 76° 09′ 6″ S, 168° 40′ E, 26 Jan. 1936, 520 m.

Hedley (1916) recorded the species from off the Shackleton Ice-shelf, 65° 20′ S, 95° 27′ E in 40 fathoms.

Family CERITHIIDAE

Genus **Ataxocerithium** Tate, 1893

Type (o.d.): *Cerithium serotinum* Adams, Tasmania

The Magellan species *pullum* is referred to the above genus with some hesitation, since I know othing of either the opercular or the radula characters of the Tasmanian genotype. On shell features, owever, *pullum* is not dissimilar from *serotinum*.

The operculum in *pullum* is ovate, slightly D-shaped, paucispiral, with the nucleus near to the inner ower margin, which makes it a typical member of the Cerithiidae. The protoconch is very small and lender, consisting of 1½ smooth papillate whorls followed by 1½ whorls of brephic axials. The radula is f the same general type as that of *Cerithium* except for the marginals, which have, in addition to their normal bifid extremities, several well-developed cusps, which branch at right angles from the ventral margin. There is only one of these side cusps on the inner marginal, but there are three on the outer marginal. There is nothing comparable with these marginals in the Cerithiidae radulae figured by Troschel (1858, pls. 9–12).

Ataxocerithium pullum (Philippi)

Cerithium pullum Philippi, 1845*b*, p. 66.
Cerithium caelatum Couthouy, 1849, p. 148, fig. 174*a–d*.
Cerithium pullum Rochebrune & Mabille, 1889, p. H 40.
Cerithium pullum Strebel, 1905*b*, p. 652, pl. 23, fig. 40*a–d*.
Cerithium pullum Melvill & Standen, 1907, p. 105.
Cerithium pullum Strebel, 1908, p. 47.
Cerithium pullum Melvill & Standen, 1912, p. 351.

DENTITION. Fig. I, 34, p. 191. St. WS 225. PROTOCONCH. Fig. N, 102, p. 196.

TYPE LOCALITY. Strait of Magellan.

St. 51. Off Eddystone Rock, East Falkland Is., 7 miles N 50° E to 7·6 miles N 63° E, 4 May 1926, 105–115 m.
St. 388. Off Tierra del Fuego, 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m.
St. WS 72. Off north coast of East Falkland Is., 51° 07′ S, 57° 34′ W, 5 Mar. 1927, 79 m.
St. WS 86. Burdwood Bank, 53° 53′ S, 60° 37′ W, to 53° 54′ S, 60° 32′ W, 3 Apr. 1927, 151–147 m.
St. WS 97. North-west of Falkland Is., 49° S, 62° W to 49° 01′ S, 61° 56′ W, 18 Apr. 1927, 146–145 m.
St. WS 225. North-west of Falkland Is., 50° 20′ S, 62° 30′ W, 9 June 1928, 162–161 m.
St. WS 239. North-west of Falkland Is., 51° 10′ S, 62° 10′ W, 15 July 1928, 196–192 m.
St. WS 243. Between Falkland Is. and Point Santa Cruz, Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m
St. WS. 247. North of Falkland Is., 52° 40′ S, 60° 05′ W, 19 July 1928, 172 m.
St. WS 250. North of Falkland Is., 51° 45′ S, 57° W, 20 July 1928, 251-313 m.

St. WS 750. North-east of Falkland Is., 50° 50′ S, 57° 15′ 13″ W, 18–19 Jan. 1932, 95 m.
St. WS 824. Off East Falkland Is., 52° 29′ S, 58° 27′ W, 19 Jan. 1932, 146–137 m.
St. WS 865. Between Falkland Is. and Patagonia 50° 03 S, 64° 14 W, 29 Mar. 32, 128–126 m.

RANGE. Patagonia, Burdwood Bank (Melvill & Standen, 1912) and Falkland Is., 8–196 m.

Genus **Cerithiella** Verril, 1882

n.nom. for *Lovenella* Sars, 1878, *non* Hincks, 1869

Type (monotypy): *Cerithium metula* Loven

Strebel (1908) and Thiele (1912) have placed a number of small Antarctic species in this Recent European genus. These shells conform to the genotype in having a stout, bulging, smooth protoconch of about two whorls and similar apertural features, but two series are represented: (1) *astrolabiensis* Strebel, 1908, *erecta* Thiele, 1912, *similis* Thiele, 1912, and *seymouriana* Strebel, 1908, all of which have plain spiral keels without axials; and (2) *superba* Thiele, 1912, and *werthi* Thiele, 1912, which, like the genotype, have the spiral keels crossed and beaded by axials.

The two empty shells recorded below provide no additional information concerning the relationships of these southern groups, so Thiele's placing is retained.

Cerithiella seymouriana (Strebel)

Bittium seymourianum Strebel, 1908, p. 47, pl. 4, fig. 50*a–c*.
Cerithiella seymouriana Thiele, 1912, p. 261.

TYPE LOCALITY. South-east of Seymour I., 64° 20′ S, 56° 38′ W, 150 m.

St. WS 33. Off South Georgia, 54° 59′ S, 35° 24′ W, 21 Dec. 1926, 130 m.

One example, 8 × 2·4 mm., compared with 8·2 × 2·9 mm. for Strebel's type.

Cerithiella astrolabiensis (Strebel)

Bittium astrolabiensis Strebel, 1908, p. 48, pl. 4, fig. 51*a–c*.
Cerithiella astrolabiensis Thiele, 1912, p. 261.

TYPE LOCALITY. Astrolabe I., 63° 9′ S, 58° 17′ W, 95 m.

St. 363. 2·5 miles S 80° E of South-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–298 m.

Strebel's type was a juvenile of five post-nuclear whorls and measured 3·3 × 1·3 mm. The St. 363 example, which I judge to be the adult of this species, has 9½ post-nuclear whorls and measures 11·5 × 3·9 mm. The species differs from *seymouriana* only in being proportionately broader and more tightly coiled.

Family TURRITELLIDAE

Genus **Turritellopsis** Sars, 1878

Type (monotypy): *Turritellopsis acicula* Stimpson
Recent, North Atlantic

Turritellopsis thielei n.sp., Pl. VII, fig. 26

Shell with an attenuated spire of slowly increasing whorls, sculptured with prominent flat-topped spiral cords, four to five per whorl. The spiral cords are separated by interspaces of about 1½ times their width, except for the uppermost, which has a double space between it and the suture, and the lowest, which is almost joining the suture below. The body-whorl has the addition of six cords on the base, but the lower two or three are weak. In the paratype, which is a young shell, the subsutural space is occupied by two subsidiary linear-spaced cords, which are much weaker than the rest. Aperture subcircular, the columellar-basal portion of the peristome split in two by a deep median groove. Both examples have the early whorls missing.

Length (4 whorls only) 8·5 mm.; diameter 3·8 mm. (holotype).

Length (5¾ whorls only) 9·25 mm.; diameter 3·0 mm. (paratype).

Type locality. St. 181. Schollaert Channel, Palmer Archipelago, 64° 20′ S, 63° 01′ W, 12 Mar. 927, 160–335 m.

The species is nearest related to *Turritellopsis gratissima* Thiele from Gauss Station, Davis Sea, hich has one spiral less per whorl.

It is possible that my paratype of *theilei* is not identical with the holotype, but more material is ecessary to determine this.

These Antarctic species seem to be correctly placed in *Turritellopsis*, the radula of which lacks arginal teeth. Thiele (1912, pl. 15, fig. 23) figured the dentition of his *T. gratissima*, and this also hows three teeth only, a central and a pair of laterals only.

Genus **Colpospirella** n.g.

Type: *Turritella algida* Melvill & Standen

This is a very small Turritellid, apparently never more than 6 mm. in height, having a relatively arge, smooth, papillate protoconch of 2½ whorls, the last with a blunt median keel. The protoconch is ery like that of the Australian *Colpospira*, but the labial profile is only moderately sigmoid, not deeply inused as in the Australian genus.

olpospirella algida (Melvill & Standen)

Turritella algida Melvill & Standen, 1912, p. 352, pl. fig. 14.

Type locality. Burdwood Bank, south of the Falkland Is., 56 fathoms.

St. 27. West Cumberland Bay, South Georgia, 3·3 miles S 44° E of Jason Lt., 15 Mar. 1926, 110 m.

St. 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 15 Jan. 1927, 155–178 m.

St. WS 816. West of Falkland Is., 52° 09′ 45″ S, 64° 56′ W, 14 Jan. 1932, 150 m.

St. WS 210. North of Falkland Is., 50° 17′ S, 60° 06′ W, 29 May 1928, 161 m.

St. WS 211. 50° 17′ S, 60° 06′ W, 29 May 1928, 174 m.

St. WS 838. Between Falkland Is. and Patagonia, 53° 11′ 45″ S, 65° W, 5 Feb. 1932, 148 m.

Genus **Mathilda** Semper, 1865

Type: *Turbo quadricarinata* Brocchi, Pliocene, Italy

Mathilda malvinarum (Strebel)

Cerithiopsis malvinarum Strebel, 1908, p. 49, pl. 1, fig. 10*a–c*.

Type locality. Port Louis, Falkland Is., 1 m.

St. WS 225. North-west of Falkland Is., 50° 20′ S, 62° 30′ W, 9 June 1928, 162–161 m.

St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.

Family EULIMIDAE

Genus **Balcis** Leach, 1847

Type: *Balcis montagui* (= *B. alba* da Costa)

Balcis antarctica (Strebel)

Eulima antarctica Strebel, 1908, p. 65, pl. 6, fig. 91*a–c*.

Type locality. South-east of Seymour I., 64° 20′ S, 56° 38′ W, 150 m.

St. 363. 2·5 miles S 80° E of south-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–278 m.

Melvill & Standen (1912, p. 352) ascribed to this species an immature example from Burdwood Bank in 56 fathoms, but the record requires confirmation.

Balcis cf. tumidula (Thiele)

Eulima tumidula Thiele, 1912, p. 193, pl. 11, fig. 31.

Type locality. Gauss Station, Davis Sea.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m.

If I have correctly determined the St. 170 shells, the species attains a larger size than cited by Thiele.
Height 5·25 mm.; diameter 2·0 mm. (holotype).
Height 8·0 mm.; diameter 3·2 mm. (St. 170).

Balcis cf. solitaria (Smith)

Eulima solitaria Smith, 1915, p. 64, pl. 1, fig. 3.

Type locality. Off Cape Bird Peninsula, 250 fathoms, McMurdo Sound.

St. 190. Bismarck Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 24 Mar. 1927, 93–130 m.

One example, 8·34 × 2·8 mm., of 8½ whorls, which appears to be the adult of Smith's species of seven whorls and dimensions of 4 × 1·5 mm.

Family EPITONIIDAE

Genus **Cirsotrema** Moerch, 1852

Type: *Scalaria varicosa* Lamarck

Cirsotrema magellanica (Philippi)

Scalaria magellanica Philippi, 1845*b*, p. 46.
Scalaria (*Opalia*) *magellanica* Strebel, 1905*b*, p. 656, pl. 23, fig. 44*a–f*.
Scalaria magellanica Strebel, 1908, p. 63.
Scala magellanica Melvill & Standen, 1912, p. 347.

Type locality. Strait of Magellan.

St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 105–115 m.

St. WS 228. Off north-east end of Falkland Is., 50° 50′ S, 56° 58′ W, 30 June 1928, 229 m.

Range. Lively I., Falkland Is. (Strebel, 1905); Port William, 40 m., Falkland Is. (Strebel, 1908); Punta Arenas (shore), Puerto Harris, 15 fathoms (Strebel, 1905); Burdwood Bank, 56 fathoms (Melvill & Standen, 1912).

Cirsotrema magellanica latecostata (Strebel)

Scalaria magellanica var. *latecostata* Strebel, 1905*b*, p. 658, pl. 23, figs. 43*a–d*.

Type locality. Strait of Magellan.

St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m.
St. WS 222. Between Patagonia and Falkland Is., 48° 23′ S, 65° W, 8 June 1928, 100–106 m.
St. WS 766. Between Falkland Is. and Argentina, 45° 13′ S, 59° 56′ 30″ W, 18 Oct. 1931, 545 m.
St. WS 797. Between Patagonia and Falkland Is., 47° 45′ 18″ S, 64° 10′ 30″ W, to 47° 47′ 43″ S, 64° 07′ 30″ W, 19 Dec. 1931, 117 m.

Cirsotrema fenestrata (Strebel)

Scalaria fenestrata Strebel, 1908, p. 63, pl. 4, fig. 61*a–d*.

Type locality. Cumberland Bay, South Georgia, 253–310 m.

St. 140. Stromness Harbour to Larsen Point, South Georgia. From 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W, 23 Dec. 1926, 122–136 m. (one half-grown example).

Genus **Acirsa** Moerch, 1857

Type (Cossmann, 1912): *Scalaria costulata* Mighels

cirsa antarctica (Smith)

Scala antarctica Smith, 1907, p. 8, pl. 1, figs. 10, 10*b*.
Epitonium antarcticum Smith, 1915, p. 64.

Type locality. Hole 12, 'Discovery' Winter Quarters, McMurdo Sound.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m. (two juveniles).

Recorded by Smith (1915) from the Ross Sea, 158 fathoms.

cirsa annectens n.sp. Pl. VII, fig. 23

Shell moderately large, attenuated, of rapidly increasing convex whorls, dull white, solid, axially ostate but axials subobsolete on last two whorls. A prominent supra-sutural spiral fold forms a heavy arina on the last whorl. Protoconch missing, 6½ post-nuclear whorls remaining in holotype, the only dult specimen. The axials number about twenty on the early whorls. The whole surface is crossed by bobsolete spiral cords too indistinct to be accurately counted but approximately twenty on the enultimate.

Height 11·5 mm.; diameter 4·5 mm.

Type locality. St. WS 766. North of Falkland Is. 45° 13′ S, 59° 56′ 30″ W, 18 Oct. 1931, 545 m.

The species resembles *antarctica* Smith, but is not so definitely sculptured and has a more massive tural carina.

Family NATICIDAE

Genus **Amauropsis** *Moerch*, 1857

Type (s.d. Dall, 1909): *Natica helicoides* Johnson

Hedley (1916) diagnosed an Antarctic series of Naticoids as follows: 'There is an Antarctic naticoid roup which cannot be received by any of the above (i.e. *Natica*, *Cochlis*, *Cryptonatica*, *Polinices*, *uspira*, *Cepatia*, *Mamillaria*), or by other known extra-limital groups such as *Cernina* or *Mammilla*, ot discussed by Dr Dall. So far this amounts to about a dozen rather featureless species, all small, ostly uniform olive buff in colour, four whorls, a slightly raised spire, a caducous epidermis, comaratively thin, unsculptured, except for incremental striae, without umbilical funicle or a callus pad at e insertion of the right lip. Operculum corneous paucispiral.'

Unfortunately, in nominating the Recent south-eastern Australian *Natica beddomei* Johnston as enotype of his new genus *Friginatica*, Hedley has in effect deviated from his intention, for *beddomei* as gured by Watson (1886, pl. 28, fig. 3) is a small solid shell with a channelled suture but apparently no pidermis.

Smith (1907) used the Arctic Recent genus *Amauropsis* for one of this Antarctic series, i.e. *A. rossiana* mith from 'Discovery' Winter Quarters, and since these shells fit this genus in a general way there is o reason why at this stage of our knowledge *Amauropsis* should not be used. The genotype of *mauropsis* is a large shell (1–1·5 in.), thin, with channelled suture; umbilicus a narrow line; chalky hite, covered with a light yellowish brown epidermis (Tryon, 1886, p. 53, pl. 22, fig. 31). The perculum is horny.

There is no marked difference between the radula of the Arctic *helicoides* (Troschel, 1861, pl. 15, g. 6) (Fig. J, 41) and that of the Antarctic *anderssoni* Strebel, *aureolutea* Strebel and *rossiana* (Eales, 923) (Fig. J, 43). Each has a tricuspid central tooth, a bifid inner marginal and a simple outer marginal.

The laterals alone vary slightly in that those of *helicoides*, *anderssoni* and *rossiana* are tricuspid and those of *aureolutea* bicuspid. The Antarctic members range in height between 6 (*georgianus*) and 30 mm. (*aureolutea*).

Amauropsis anderssoni (Strebel) Pl. X, figs. 58, 59

Natica anderssoni Strebel, 1906, p. 142, pl. 11, fig. 67*a*, *b*.
Natica anderssoni Strebel, 1908, p. 61, pl. 5, fig. 64*a*, *b*.

Type locality. Falkland Is.

St. 27. West Cumberland Bay, South Georgia, 3·3 miles S 44° E of Jason Lt, 15 Mar. 1926, 110 m.
St. 30. West Cumberland Bay, South Georgia, 2·8 miles S 24° W of Jason Lt., 16 Mar. 1926, 251 m.
St. 39. East Cumberland Bay, South Georgia, from 8 cables S 81° W of Merton Rock to 1·3 miles N 70 E of Macmahon Rock, 25 Mar. 1926, 179–235 m.
St. 42. Off mouth of Cumberland Bay, South Georgia, 1 Apr. 1926, 120–204 m.
St. 123. Off mouth of Cumberland Bay, South Georgia, 15 Dec. 1926, 230–250 m.
St. 1941. Leith Harbour, South Georgia, 29 Dec. 1936, 55–22 m.
St. MS 68. East Cumberland Bay, 1·7 miles S ½° E to 8½ cables SE × E of Sappho Point, 2 Mar. 1925, 220–247 m.
St. WS 32. Mouth of Drygalski Fjord, South Georgia, 21 Dec. 1926, 91–225 m.
St. WS. 62. Wilson Harbour, South Georgia, 19 Jan. 1927, 15–45 and 26–83 m.

Range. Falkland Is. and South Georgia, 20–310 m.

The 'Discovery' material is identical with examples examined from the Swedish South Polar Expedition's St. 34, off Cumberland Bay, South Georgia, 252–310 m., but I have not seen Falkland examples.

Dentition. Fig. J, 44, p. 192.

Amauropsis aureolutea (Strebel)

Natica aureolutea Strebel, 1908, p. 63, pl. 5, fig. 63*a*, *b*.

Type locality. South Georgia, 24–52 m.

St. 140. Stromness Harbour to Larsen Point, South Georgia, 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W, 23 Dec. 1926, 122–136 m.
St. 159. North-east of South Georgia, 53° 52′ 30″ S, 36° 08′ 00″ W, 21 Jan. 1927, 160 m.
St. 170. Off Cape Bowles, Clarence Is., 61° 25′ 30″ S, 53° 46′ 00″ W, 23 Feb. 1927, 342 m.
St. 363. 2·5 miles S 80° E of south-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–278 m
St. WS 177. Off south-east of South Georgia, 54° 58′ S, 35° 00′ W, 7 Mar. 1928, 97 m.

Range. South-west of Snow Hill I., 64° 36′ S, 57° 42′ W, 152 m. (Strebel); Clarence Is., South Sandwich Is. and South Georgia, 24–342 m.

The 'Discovery' material is identical with examples examined from the Swedish South Polar Expedition's St. 6, south-west of Snow Hill Island, 125 m. The species differs from *anderssoni* in having a brighter epidermis which is orange brown, subobsolete spiral ridges, and in being larger with a taller spire. The apical whorls are almost invariably eroded.

The largest 'Discovery' example is 27 mm. in height and 24 mm. in diameter (St. WS 177). Strebel's type is 14·9 × 14·2 mm.

Dentition. Fig. J, 42, p. 192.

Amauropsis rossiana Smith

Amauropsis rossiana Smith, 1907*a*, p. 5, pl. 1, figs. 6, 6*a*.
Amauropsis rossiana Smith, 1915, p. 69.
Pellilitorina rossiana Hedley, 1916, p. 52.
Amauropsis rossiana Eales, 1923, pp. 19, 21, fig. 21.

TYPE LOCALITY. Hut Point, 'Discovery' Winter Quarters, McMurdo Sound.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m. (one juvenile, 12 × 11·5 mm.).

RANGE. McMurdo Sound, 140–300 fathoms; off Mertz Glacier Tongue, Adelie Land, 288 fathoms; ss Sea.

DENTITION. Fig. J, 43, p. 192 (Eales, 1923, loc. cit. p. 21, fig. 21).

This species is very closely allied to *aureolutea*, but has a more deeply impressed suture and the ral sculpture is more pronounced. The operculum is horny.

The solitary 'Discovery' example has a slightly lower spire than topotypic examples from McMurdo und, 250 fathoms.

auropsis georgianus Strebel

Natica georgiana Strebel, 1908, p. 62, pl. 5, fig. 65*a*, *b*.

TYPE LOCALITY. South Georgia, 64–74 m.

St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 238–270 m.

have not seen type material, but suspect that this may be merely a form of *anderssoni*.

Subgenus **Kerguelenatica** n.subg.

Type: *Natica grisea* Martens, 1878

At least subgeneric status is warranted for *grisea*, for it has an operculum which is formed of both ny and calcareous materials. It is admirably described by Watson (1886, p. 432) as follows: 'It has hinnish calcareous layer over a pretty strong horny interior, which projects uncovered round the ire edge, but this uncovered edge is narrowest on the inner side, i.e. near the pillar of the shell or re of the operculum. Here the exterior flat surface of the calcareous layer is thickened by a thin, y grey, spreadout spot of limy substance. Beyond this spot the surface of the calcareous layer is ongly scored with radiating lines. Its inner surface can be seen through the horny layer to be rply and delicately striate spirally.' Like the *Amauropsis* series the shell lacks a funicular callus and a thick yellowish brown epidermis.

As already explained under *Amauropsis*, the species *grisea* cannot be covered by *Friginatica* as Hedley ended, for the south-eastern Australian genotype, *beddomei*, apparently lacks epidermis, and according Cotton (1931, p. 20) the operculum is horny.

Unfortunately, in describing the Macquarie Island *Friginatica pisum* Hedley (1916) made no reference he operculum, but Tomlin (1948), p. 228, remarked that it is 'dark coloured and horny.' The species y be located provisionally in *Amauropsis*. I favour reinstating Marwick's *Sulconacca* (1924, p. 556), e: *S. vaughani* Marwick, Lower Miocene, New Zealand, in preference to *Friginatica* which becomes tricted to its Recent south-eastern Australian genotype. *Sulconacca* has the umbilical area margined a strong spiral ridge.

The presumed occurrence of *Amauropsis* in both the Arctic and Antarctic regions may seem unural and certainly brings up once more the question of bipolarity.

Amauropsis is a high-latitude stenothermic mollusc related to *Polinices*, which is widely distributed in rmer seas. *Polinices* is of considerable antiquity (common in the Tertiary of most regions), and it is ely that *Amauropsis* also had sufficient time and opportunity during the colder periods of the istocene to accomplish bipolar distribution. The new subgenus *Kerguelenatica* is considered to be ocal product from *Amauropsis* originating in the Kerguelenian Province. From consideration of e *Sulconacca* is probably not related nor is *Friginatica* in its restricted usage.

Amauropsis (Kerguelenatica) grisea (Martens), Pl. X, fig. 60

Natica grisea Martens, 1878, p. 24.
Natica grisea Watson, 1886, p. 432, pl. 28, fig. 5.
Natica delicatula Smith, 1902, p. 206, pl. 24, fig. 6.
Natica grisea Martens & Thiele, 1903, p. 64, pl. 4, figs. 2, 3, and pl. 8, fig. 44 (radula).
Natica grisea Strebel, 1908, p. 61.
Natica delicatula Thiele, 1912, p. 199, pl. 12, figs. 16, 17.
Natica grisea Smith, 1915, p. 69.
Friginatica grisea Hedley, 1916, p. 52.
Polinices (*Lunatia*) *grisea* L. David, 1934, p. 128.

Type locality. Kerguelen I.

St. 175. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.
St. 456. 1 mile east of Bouvet I., 18 Oct. 1930, 40–45 m. (two empty shells).
St. 1660. Ross Sea, 74° 46′ 45″ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.
St. 1952. Between Penguin I. and Lion's Rump, King George Is., South Shetlands, 11 Jan. 1937, 367–383 m

Range. Graham Land, 64° 3′ S, 56° 37′ W, 360 m. (Strebel); South Shetlands; South Georgi 252–310 m., and between South Georgia and Falkland Islands, 2675 m. (Strebel); Bouvet I.; Kerguele I., 25–95 fathoms (Watson); Cape Adare, 26 fathoms (Smith); McMurdo Sound, 190–250 fathom (Smith); Commonwealth Bay, 25 fathoms and off Shackleton Ice-shelf, 240 fathoms (Hedley); Ros Sea.

The species is easily recognized, as explained above, by the composite nature of the operculum which is horny but with an outer limy covering. It is possible that more than one species is represente in the range covered, but I do not have access to sufficient material to determine this. The Sout Georgian? shell figured by Strebel (1908) is not so depressed as Kerguelen topotypes, two of whic from Royal Sound, 20 fathoms (British Museum) are figured.

Dentition. Fig. J, 45, p. 192 (Martens & Thiele, 1903).

Genus **Polinices** Montfort, 1810

Type (o.d.): *Polinices albus* Montfort=*Nerita mammilla* Linn., West Indies

Polinices patagonicus (Philippi)

Natica patagonica Philippi, 1845*b*, p. 65.
Natica patagonica Hupé (Gay), 1854, p. 221.
Natica patagonica Tryon, 1886, p. 37, pl. 14, fig. 24.
Natica patagonica Rochebrune & Mabille, 1889, p. H 35.
Natica patagonica Strebel, 1906, p. 137, pl. 11, fig. 63.
Natica patagonica Strebel, 1908, p. 61.

Type locality. North-east Strait of Magellan.

St. 158. North-east of South Georgia, 53° 48′ 30″ S, 35° 57′ 00″ W, 21 Jan. 1927, 401–411 m.
St. WS 247. South of Falkland Is., 52° 40′ S, 60° 05′ W, 19 July 1928, 172 m.

Range. Strait of Magellan (type); Punta Arenas, Tierra del Fuego and Puerto Pantalon, 7 fathom (Strebel); Lively I., Falkland Is. (Strebel); South Georgia.

The 'Discovery' material consists of two badly eroded shells which are probably the above species They measure respectively: height 28·5 mm., diameter 27 mm. (St. WS 247); height 26 mm. diameter 22 mm. (St. 158).

Genus **Falsilunatia** n.g.

Type: *Natica soluta* Gould, 1848

On shell and opercular characters *soluta* is not dissimilar from *catena* Da Costa, the Recent English notype of *Lunatia*, but the dentition is most distinctive.

In *catena* the radula is normal for the family—a tricuspid central tooth of more or less rectangular m, laterals with three or four cusps and the inner marginal with a side cusp, thus approximating the id form. In *soluta* the central tooth is hemispherical with a large, broadly triangular central cusp but erely vestigial side cusps. The laterals have a broad massive cusp with a slight incision or incipient nticle near the base of its inner margin. The marginals are simple, not bifid, the outer one the longer.

The umbilicus is narrower than in *Lunatia* and may be open or closed according to the relative wnward encroachment of the parietal callus.

lsilunatia soluta (Gould)

Natica soluta Gould, 1848, p. 239.
Natica soluta Tryon, 1886, p. 39, pl. 9, fig. 71.
Natica soluta Strebel, 1906, p. 138, pl. 11, figs. 61, 62 and 64–66.
Natica soluta Strebel, 1908, p. 60.

TYPE LOCALITY. Southern coast of South America.

St. 48. 8·3 miles N 53° E of William Point Beacon, Port William, Falkland Is., 3 May 1926, 105–115 m.
St. 51. Off Eddystone Rock, East Falkland Is., 4 May 1926, 115 m.
St. WS 244. West of Falkland Is., 52° 00′ S, 62° 40′ W, 18 July 1928, 247 m.
St. WS 808. Between Falkland Is. and Patagonia, 49° 40′ 15″ S, 65° 42′ W, 8 Jan. 1932, 109–107 m.
St. WS 817. Between Falkland Is., and Patagonia, 52° 23′ S, 64° 19′ W, 14 Jan. 1932, 191–202 m.

DENTITION. Fig. J, 47, p. 192.

Strebel (loc. cit. 1907) subdivided his material, on the size of the umbilical cavity, into forms 'A', ' and 'C'. Forms A and C are here covered by *soluta* typical, but form B, which equals Mabille Rochebrune's *recognita*, I consider to be specifically separable on account of the spreading of the rietal callus pad, which results in the closing of the umbilicus from above and a disproportionate ickening and flexing of the columellar callus.

lsilunatia recognita (Rochebrune & Mabille)

Natica recognita Rochebrune & Mabille, 1889, p. H 33.

TYPE LOCALITY. Orange Bay, Patagonia, 120 m.

St. WS 766. Between Falkland Is., and Argentina, 45° 13′ S, 59° 56′ 30″ W, 18 Oct. 1931, 545 m.

DENTITION. Fig. J, 48, p. 192. The radula is very similar to that of *soluta*, but presents minor differences the shape of the central tooth, which is narrower and more acutely arched, and in the laterals, which ve a shorter cusp and the addition of several denticles. The inner basal plate of the central tooth is engthened by two massive vertical processes, which, when viewed laterally, are shown to act as ttresses. The marginals are simple as in *soluta*.

A similar style of central tooth is found in the New Zealand genus *Globisinum* (Powell, 1933, p. 170) ig. J, 49) and in *Natica fartilis* Watson (1881), from between Marion Island and Prince Edward land in 50–140 fathoms.

Apart from radula similarities, *Falsilunatia* differs from *Globisinum* in having an animal that is mpletely retractive and a smaller, more solid shell. The animal in the New Zealand *G. venustum* ter resembles that of *Sinum* in being much larger than the shell, but it is not known if an operculum normally present. The operculum in *Natica fartilis* is shelly.

A third member of *Falsilunatia* appears to be Preston's *Natica falklandica* (1913, p. 218) from Por Stanley, Falkland Islands. It is thin and globose, relatively large and with more elevated spire-whorl than in either *soluta* or *recognita*, but its shape suggests *Falsilunatia* rather than *Globisinum*. Tw examples from the British Museum collection were examined (Pl. X, fig. 61). The dimensions of thes specimens are respectively: height 17 mm., diameter 14·5 mm.; and height 14·75 mm., diameter 13 mm

Genus **Sinuber** n.g.

Type: *Natica sculpta* Martens

The above new genus is provided for small *Sinum*-like species, the true relationship of which i probably with *Polinices* rather than with *Sinum*. The shell is thin, white, with a very inconspicuou epidermis, a transparent, almost colourless film; protoconch smooth and glossy, or with faint spira lines; post-nuclear sculpture of deeply incised linear grooves; umbilicus narrow and partly bridged not infilled, by a reflexed columellar callus; columella almost vertical; operculum paucispiral and horny

The radula is of a style common in the family and similar to that of *Polinices* and *Amauropsis*. Mino differences are that the side cusps of the central tooth are relatively small, the laterals are deepl sinused on their inner edge and bear three weak cusps, while the marginals have simple arcuatel pointed, not bifid cusps. It was shown by Troschel (1861, pl. 15, figs. 15, 16) and by Iredale (192 p. 256) that true *Sinum* has a broad central tooth with the two side cusps more prominent than th central one. The *Sinum*-like genera of *Polinices* affinity—i.e. *Sigaretotrema* Sacco, 1890 (= *Propesinu* Iredale 1924) and *Eunaticina* Fischer, 1885—are not applicable either, for Iredale pointed out (loc. cit. that their tendency is for the central to become unicuspid.

Sinuber sculpta (Martens)

Natica sculpta Martens, 1878, p. 24.
Natica sculpta Martens & Thiele, 1903, p. 65, pl. 4, fig. 1.

TYPE LOCALITY. Kerguelen I.

Form A. St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.
Form B. St. WS 212. North of Falkland Is., 49° 22′ S, 60° 10′ W, 30 May 1928, 242–249 m.
St. WS 773. North of Falkland Is., 47° 28′ S, 60° 51′ W, 31 Oct. 1931, 291–296 m.

The type locality for *sculpta* is Kerguelen Island, and closely allied forms of it range southward to th Ross Sea and westward to north of the Falklands, South Georgia and South Orkneys.

Unfortunately, I do not have access to topotypic material, and Marten's description is rather lackin in detail. His figure of the holotype, however (1903, pl. 4, fig. 1), and his measurements of the shel show that the South Orkney-South Georgia form is relatively wider and that the aperture is lower i relation to the height of the shell. This form is described below as a new subspecies.

Ross Sea examples (St. 1660) and those from north of the Falklands (St. WS 212 and WS 773) ar small, relatively narrow forms, the former openly umbilicate and the latter with the umbilicus almos closed by the reflexed columellar callus. These two forms exhibit a difference in the number of spira grooves, but since I cannot make an accurate comparison with *sculpta* on this point, Ross Sea an Falkland material must be tentatively referred to *sculpta*.

Sinuber sculpta scotiana n.subsp., Pl. V, fig. 10

Natica sculpta: Strebel, 1908, p. 62.

This form differs from typical *sculpta*, as shown by reference to Marten's original description an figure, in being relatively wider and with a lower aperture. The protoconch is faintly spirally striat and there are from sixteen to eighteen linear grooves on the first post-nuclear whorl, twenty on th nultimate, forty-five moderately widely spaced on the body-whorl, plus a further twenty-five much ɜaker spirals, which are crowded into the umbilical cavity. Spire about half height of aperture. mbilicus a narrow pit partially bridged by a thin-edged broadly reflexed columellar lip. Columella rtical, basal section of lip rounded and thickened; outer lip thin.

The differences between the several forms of *sculpta* are best shown in tabular form. (Spirals = ımber of spiral grooves on the first post-nuclear whorl.)

Height 9·0 mm.; diam. 7 mm.; aperture 7 × 4 mm.; spirals (*sculpta*).
Height 9·5 mm.; diam. 8 mm.; aperture 6·75 × 4·5 mm.; spirals 16–18 (*scotiana*).
Height 9·0 mm.; diam. 7·8 mm.; aperture 6·5 × 4 mm.; spirals 16–18 (*scotiana*).
Height 8·9 mm.; diam. 7·5 mm.; aperture 6·5 × 4 mm.; spirals 16–18 (*scotiana*).
Height 8·5 mm.; diam. 7·2 mm.; aperture 6·0 × 4 mm.; spirals 16–18 (*scotiana*).
Height 6·5 mm.; diam. 5·0 mm.; aperture 4·3 × 2·5 mm.; spirals 12–17 (Form A).
Height 6·3 mm.; diam. 5·0 mm.; aperture 4·5 × 2·5 mm.; spirals 9–12 (Form B).

DENTITION. Fig. J, 50, p. 192. The radula is so minute that it must be almost functionless. The only fference in detail between the radula of *sculpta* (Form, B, St. WS 773) and *scotiana* (St. 167) are that e former has better developed cusps on the laterals and a bifid inner marginal.

St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, 238–270 m.
St. 167. Off Signy I., South Orkneys, 60° 50′ 30″ S, 46° 15′ 00″ W, 20 Feb. 1927, 244–344 m. (holotype and numerous paratypes).
St. WS 32. Mouth of Drygalski Fjord, South Georgia, 21 Dec. 1926, 225 m.

Genus **Prolacuna** Thiele, 1913.

n.nom. for *Sublacuna* Thiele, 1912 *non* Pilsbry, 1895

Type (o.d.): *Sublacuna indecora* Thiele (= *Frigidilacuna* Tomlin, 1930, another substitute for *Sublacuna* Thiele, 1912)

olacuna indecora (Thiele)

Sublacuna indecora Thiele, 1912, p. 195, pl. 12, fig. 4; pl. 15, fig. 19.
Sublacuna indecora Smith, 1915, p. 66.
Sublacuna indecora Eales, 1923, p. 21.

TYPE LOCALITY. Gauss Station, Davis Sea.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

RANGE. Davis Sea to Ross Sea.

Eales (loc. cit. pp. 21–3) figured the operculum, jaws and radula which, together with general atomical considerations, show that the genus is Naticoid. It differs from other Naticoids in two important details—the absence of a 'veil' over the snout and the coalescence of the tentacle bases the mid-dorsal line.

According to Thiele (1912) the genus includes the following three species: *Sublacuna trilirata* iele, 1912, Gauss Station; *Lacuna macmurdensis* Hedley (1911) 10–20 fathoms, Cape Royds; and *cuna notorcadensis* Melvill & Standen (1907), Scotia Bay, South Orkneys, 9–10 fathoms.

It is doubtful if these heavily spirally keeled species are really congeneric with the smooth *indecora*.

olacuna? macmurdensis (Hedley)

Lacuna macmurdensis Hedley, 1911, p. 4, pl. 1, fig. 6.

TYPE LOCALITY. 10–20 fathoms, Cape Royds, Ross Sea.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

Genus **Tectonatica** Sacco, 1890

Type (monotypy): *Natica tectula* Bonelli, Pliocene, Italy

Tectonatica impervia (Philippi) Pl. X, fig. 62

Natica impervia Philippi, 1845*a*, II, fig. 6.
Natica impervia Hupé (Gay), 1854, p. 221.
Natica impervia Tryon, 1886, p. 31, pl. 9, fig. 66.
Natica impervia Rochebrune & Mabille, 1889, p. H 34.
Natica impervia Strebel, 1906, p. 134, pl. XI, fig. 60.
Natica impervia Strebel, 1908, p. 61.
Natica impervia Melvill & Standen, 1912, no. 18, p. 348.

TYPE LOCALITY. Strait of Magellan.

St. 51. Off Eddystone Rock, East of Falkland Is., 4 May 1926, 105–115 m.
St. 159. Off South Georgia, 53° 52′ 30″ S, 36° 08′ 00″ W, 21 Jan. 1927, 160 m.
St. WS 795. North of Falkland Is., 46° 14′ S, 60° 24′ W, 18 Dec. 1931, 157–161 m.
St. WS 838. Between Falkland Is. and Strait of Magellan, 53° 11′ 45″ S, 65° 00′ 00″ W, 5 Feb. 1932, 148 m.

These shells are characterized by a massive funicle which fills the umbilicus and is defined on it outer edge by a crescentic grove. The operculum is white and calcareous except for a thin horny laye on the inner side. The exterior is smooth, without sulci. The 'Discovery' examples have been compare with Falkland Islands material from the British Museum.

Strebel (1908) described a var. *major* from Paulet Island, 100–150 m., but I have not seen examples

DENTITION. Fig. J, 46, p. 192. The radula conforms in general features with that most commonl found in Naticoids. The central tooth is tricuspid, but the side cusps are much shorter than the central which reaches right to the basal margin. The laterals have a large centre cusp with a very weak one o each side. The inner marginal is simple, long and slender, the outer shorter, more robust and bifid at th tip, a reversal of the usual arrangement, for in all other instances known to me it is the inner margina that is the bifid member.

Several authors (Dall, 1892; Woodring, 1928; Finlay & Marwick, 1937) have synonymized *Crypto natica* Dall, 1892 (type *Natica clausa* Brod. & Sowb.), but the dentition of this Arctic species does no conform with that of *impervia.* In *clausa* (Troschel, 1861, pl. 14, fig. 14), the central has a single larg cusp and the marginals are both simple.

Since the radula and opercular features are unknown quantities for the Pliocene genotype *Tectonatica*, I am at present justified only in disassociating *impervia* from *Cryptonatica.*

RANGE. Strait of Magellan (type); Tierra del Fuego, 36 m. (Strebel); off Falkland Is., 105–161 m Burdwood Bank, Falklands area, 56 fathoms (Melvill & Standen); South Georgia; Paulet I., 100–150 m (var. *major*).

Family LAMELLARIIDAE

Genus **Lamellaria** Montagu, 1815

Type: *Lamellaria perspicua* Linn.

Lamellaria patagonica Smith

Lamellaria patagonica Smith, 1881, p. 32, pl. 4, figs. 9, 9*a*, 9*b*.
Lamellaria patagonica Rochebrune & Mabille, 1889, p. H 36.

TYPE LOCALITY. Trinidad Channel, 30 fathoms, Patagonia.

St. 56. Sparrow Cove, Port William, East Falkland Is., 16 May 1926, 10½–16 m.

One example only, easily recognized by the dirty yellow ground colour of the mantle, which is line and blotched with vandyke brown, as described by Smith.

amellaria sp. A

The examples recorded below are probably *L. fuegoensis* Strebel (1906), but owing to hardening of ie animal in alcohol and the extreme fragility of the shell I was unable to extract any shells intact.

Dentition. Fig. J, 53, p. 192. St. WS 867. The central tooth is the characteristic saddle-shape, but ie cusps are very poorly developed. The laterals are massive, of typical shape, and bear prominent enticles along the upper and lower cutting edges.

St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.
St. WS 867. Between Falkland Is. and Patagonia, 51° 10′ S, 64° 15·5′ W, 29 Mar. 1932, 137–144 m.

amellaria elata Strebel

Lamellaria elata Strebel, 1906, p. 146, pl. 11, fig. 72.

Type locality. Puerto Condor, Patagonia.

St. WS 81. 8 miles N 11° W of North I., West Falkland Is:, 19 Mar. 1927, 81–82 m.

Dentition. Very similar to that of 'sp. A'. Central tooth saddle-shaped with a broad, short, entral cusp and five denticles on each side of it. Laterals massive and hooked with prominent denticles ong both the upper and lower cutting edges.

Genus **Marseniopsis** Bergh, 1886

Type (Thiele, 1929): *Marseniopsis pacifica* Bergh

arseniopsis pacifica Bergh

Marseniopsis pacifica Bergh, 1886, p. 19, pl. 1, figs. 7–27.

Type locality. Kerguelen I.

St. 42. Off mouth of Cumberland Bay, South Georgia, 1 Apr. 1926, 120–204 m.
St. 167. Off Signy I., South Orkneys, 60° 50′ 30″ S, 46° 15′ W, 20 Feb. 1927, 244–344 m.
St. 190. Bismarck Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 24 Mar. 1927, 93–130 m.

Dentition. Formula 2+1+1+1+2. The central tooth is narrow with a deep entire base, not ddle-shaped as in *Lamellaria*, and there is a long, narrow, central cusp with four denticles on each side. he lateral is massive and hooked with four serrations near the lower cutting edge. In addition, there e paired smooth slender marginals. The radula in a St. 190 example is exactly as figured by Bergh.

Unfortunately, the specimens were too contracted and hardened to extract the shell, but since the gured central tooth of both *murrayi* Bergh, 1886, and *conica* Smith (Eales, 1923) are very different in iape and detail, I have no hesitation in assuming that the 'Discovery' material represents Bergh's *icifica*. Further, the dorsal surface of the animal in the material listed above is covered with depressed, unded tubercles exactly as in Bergh's description of *pacifica*.

Family TRICHOTROPIDAE

Genus **Antitrichotropis** n.g.

Type: *Trichotropis antarctica* Thiele, 1912

The above new genus is necessary for the Antarctic species recorded below, which differ from the oreal *Trichotropis* in being depressed turbinate and in having simple lateral teeth without denticles.

ntitrichotropis antarctica (Thiele)

Trichotropis antarctica Thiele, 1912, p. 197, pl. 12, fig. 6.
Trichotropis antarctica Smith, 1915, p. 67, pl. 1, fig. 6.
Trichotropis antarctica Hedley, 1916, p. 50.

TYPE LOCALITY. Gauss Station, Davis Sea.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

RANGE. McMurdo Sound, 300 fathoms (Smith, 1915); Adelie Land, 288 fathoms (Hedley, 1916).

DENTITION. Thiele (1912).

Unfortunately, Melvill & Standen (1912, 26 August) used the same combination '*Trichotropis antarctica*' for a different shell from Burdwood Bank in 56 fathoms, but they subsequently (1916) renamed it *Trichotropis bruceana*. Melvill & Standen's shell is in very poor preservation, and the figure suggests an immature *Trophon* (*Xymenopsis*) rather than a *Trichotropis*.

Antitrichotropis wandelensis (Lamy)

Lacuna wandelensis Lamy, 1907, p. 5, pl. 1, figs. 5–7.
Lacuna wandelensis Melvill & Standen, 1912, p. 349.

TYPE LOCALITY. Wandel I., Palmer Archipelago.

St. 175. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.
St. 195. Admiralty Bay, King George I., South Shetlands, 62° 07′ S, 53° 28′ 30″ W, 30 Mar. 1927, 391 m.

Only one example from each of the above stations. They are minus the animal, but the epidermis is well preserved and shows odd tufts of hair-like processes disposed at regular intervals on the carinae Lamy's type is evidently denuded of epidermis.

RANGE. Recorded also from Scotia Bay, South Orkneys, 9–10 fathoms (Melvill & Standen, 1912)

Genus **Trichoconcha** Smith, 1907

Type (monotypy): *T. mirabilis* Smith, 1907

Trichoconcha mirabilis Smith

Trichoconcha mirabilis Smith, 1907, p. 6, pl. 1, figs. 7, 7*b*.
Torellia (*Trichoconcha*) *mirabilis* Thiele, 1912, p. 197.
Torellia (*Trichoconcha*) *mirabilis* Smith, 1915, p. 68.
Trichoconcha mirabilis Hedley, 1916, p. 50.
Trichoconcha mirabilis Eales, 1923, p. 14.

TYPE LOCALITY. Off Coulman I. in 100 fathoms.

St. 123. Off mouth of Cumberland Bay, South Georgia. From 4·1 miles N 54° E of Larsen Point to 1·2 miles S 62° W of Merton Rock, 15 Dec. 1926, 230–250 m.
St. 140. Stromness Harbour to Larsen Point, South Georgia. From 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S 36° 29′ W, 23 Dec. 1926, 122–136 m.
St. 144. Off mouth of Stromness Harbour, South Georgia. From 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W 5 Jan. 1927, 155–178 m.
St. 148. Off Cape Saunders, South Georgia. From 54° 03′ S, 36° 39′ W to 54° 05′ S, 36° 36′ 30″ W, 9 Jan. 1927 132–148 m.
St. 149. Mouth of East Cumberland Bay, South Georgia. From 1·15 miles N 76½° W to 2·62 miles S 11° W o Merton Rock, 10 Jan. 1927, 200–234 m.

RANGE. Coulman I., Ross Sea (Smith); Commonwealth Bay, 350–400 fathoms; and off Mert Glacier Tongue, Adelie Land, 157 fathoms; Drygalski I., Davis Sea (Hedley); Gauss Station (Thiele) South Georgia, 122–250 m. ('Discovery').

The 'Discovery' records extend the range of this species to more than half the circumference of th Antarctic continent.

Major diameter 29 mm.; minimum diameter 20·5 mm.; height 19 mm. (holotype).
Major diameter 42 mm.; minimum diameter 31·0 mm.; height 31 mm. (St. 42).

DENTITION. Figured by Eales (1923, loc. cit. p. 15, fig. 12).

Genus **Neoconcha** Smith, 1907

Type (monotypy): *Neoconcha vestita* Smith

eoconcha vestita Smith

Neoconcha vestita Smith, 1907*a*, p. 6, pl. 1, figs. 11–11*c*.
Neoconcha vestita Smith, 1915, p. 68, pl. 1, fig. 8.
Neoconcha vestita Eales, 1923, p. 11.

Type locality. Off Coulman I., 100 fathoms, Ross Sea.

St. 1652. Ross Sea, 75° 56′ 2″ S, 178° 35′ 5″ W, 23 Jan. 1936, 567 m.

Major diameter 7 mm.; height 8 mm. (holotype).
Major diameter 28 mm.; height 23 mm. (Smith, 1915).
Major diameter 17·5 mm.; height 17 mm. (St. 1652).

Dentition. Figured by Eales (1923, loc. cit. p. 12, fig. 9).

The buff-coloured epidermis is like a heavy coating of cotton-wool.

Genus **Discotrichoconcha** n.g.

Type: *Discotrichoconcha cornea* n.sp.

This new genus is considered necessary for a small species of the same horny shell substance as *richoconcha* but much smaller, paucispiral and discoidal, being vertically compressed like the fresh-
ater genus *Planorbis*. The few rapidly increasing whorls coupled with the extreme compression of the
ell results in a curious broad, very shallow, rectangular aperture.

The only example is too fragile to attempt extracting the animal, which is retracted so much that the
erculum is not visible. Its great departure in shape and small size compared with *Trichoconcha* seems
warrant generic separation.

iscotrichoconcha cornea n.sp., Pl. VII, fig. 21

Shell small, horny, discoidal-planorbid, of $2\frac{3}{4}$ whorls, including a blunt, low, rounded, microscopically
irally striated protoconch of one whorl. Spire slightly sunken; umbilicus broad, open, about one-
th diameter of base, showing all the whorls, even the protoconch. Sculpture consisting of dense
cuate lamellar epidermal processes, each set with numerous short, hair-like filaments. Colour
llowish brown. The aperture is reflected over the parietal wall and slightly dilated all round; the
ape is rectangular, about three times wider than high.

Major diameter 5·3 mm.; minimum diameter 4·0 mm.; height 1·7 mm.

Type locality. St. 182. Schollaert Channel, Palmer Archipelago, 64° 21′ S, 62° 58′ W, 14 Mar.
27, 278–500 m. (holotype only).

Family CREPIDULIDAE

Genus **Crepipatella** Lesson, 1831

Type: *Crepidula dilatata* Lamarck

epipatella dilatata (Lamarck)

Crepidula dilatata Lamarck, 1822, p. 25.
Crepidula pallida Broderip, 1835, p. 204.
Crypta subdilitata Rochebrune & Mabille, 1889, p. H 37, pl. 4, fig. 11.
Crepidula dilatata Strebel, 1906, p. 166, pl. 12, fig. 87*a*, *b*; pl. 13, figs. 100*a*, *b*, 101*a*, *b*.
Crepidula dilatata Melvill & Standen, 1907, p. 130.
Crepidula dilatata Melvill & Standen, 1914, p. 117.

Type localities. ? (*dilatata*); Falkland I. (*pallida*); Orange Bay, Patagonia (*subdilitata*).

St. 55. Entrance to Port Stanley, East Falkland Is., 2 cables S 24° E of Navy Point, 16 May 1926, 10–16 m.

Family CALYPTRAEIDAE

Genus **Trochita** Schumacher, 1817

Type: *Patella trochiformis* Gmelin = *Infundibulum* of Tryon, 1886 (*non* Montfort, 1810)*

This genus covers shells with a circular outline, a conical spire with a central nucleus and a moderat sigmoid outline to the edge of the septum. The shape and central position of the nucleus recall bot the English *Calyptraea sinensis* Linn. and the New Zealand genus *Zegalerus*. The former, however, ha a more elaborate septum which terminates as a tongue forming both a spiral umbilicus and a deep sinu at its outer extremity. In *Zegalerus* the septum is gently concave to almost straight. A second Austro neozelanic genus, *Sigapatella*, has a simple arcuate septum as in *Zegalerus*, but the shell has mor rapidly increasing whorls with the apex off centre (see Fig. E).

The radula of *Trochita trochiformis* (Fig. J, 40) differs from that of *Calyptraea sinensis* (Fig. J, 38 and *Sigapatella terraenovae* (Fig. J, 39) in having a central tooth with a massive cusp and very wea side denticles, and perfectly plain marginals.

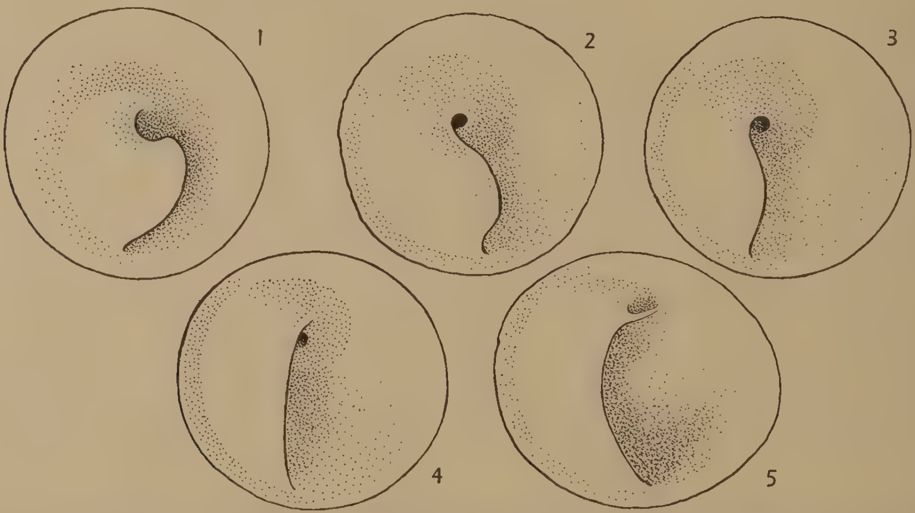

Fig. E. Septa in Calyptraeidae. (1) *Calyptraea sinensis* (Linn.), England. (2) *Trochita trochiformis* (Gmelin), Falkland I (3) *Trochita georgiana* n.sp., South Georgia. (4) *Zegalerus tenuis* (Gray), New Zealand. (5) *Sigapatella novaezelandi* Lesson, New Zealand.

Trochita trochiformis (Gmelin)

Patella trochiformis Gmelin, 1791, p. 3693.
Patella trochiformis Dillwyn, 1817, p. 1018.
Calyptraea radians Lamarck, 1836, p. 626.
Calyptraea costellata Philippi, 1845*a*, p. 62.
Trochita corrugata Reeve, 1858, fig. 96.
Calyptraea (*Infundibulum*) *radians* Tryon, 1886, p. 121, pl. 35, figs. 84–88.
Calyptraea costellata Strebel, 1906, p. 159, pl. 13, figs. 88–92, 94–97.
Calyptraea costellata Melvill & Standen, 1907, p. 100.
Calyptraea costellata Strebel, 1908, p. 59.

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* Montfort's name would undoubtedly have priority if the extremely poor figure of his genotype, '*Infundibulum typus*', wa determinable and found to be a Calyptraeid as the figure suggests. Thiele (1929, p. 55) interprets Montfort's *Infundibulu* as a section of *Trochus*.

Type localities. 'Tranquebar et insulas Falkland' (*trochiformis*); Peru and Chile (*radians*); atagonia (*costellata*).

St. 51. Off Eddystone Rock, East Falkland Is. from 7 miles N 50° E to 7·6 miles N 63 E of Eddystone Rock, 4 May 1926, 115 m.
St. WS 88. Off Tierra del Fuego, 54° S, 64° 57′ 30″ W, 6 Apr. 1927, 118 m.
St. WS 92. Between Falkland Is. and Patagonia, 51° 58′ 30″ S, 65° 01′ W, 8 Apr. 1927, 145–143 m.
St. WS 841. Burdwood Bank, 54° 11′ 45″ S, 60° 21′ 30″ W, 6 Feb. 1932, 110–120 m.

Dentition. Fig. J, 40, p. 192. St. WS 92.

Gay (1854, Hupé, p. 232) recognizes both *trochiformis* (=*radians*) and *costellata*, the former with a nge from Peru to Chile and the latter in the Strait of Magellan.

If two species are represented, it is important to ascertain the correct type locality for *trochiformis*, hich is quoted as 'Tranquebar et insulas Falkland'. Dillwyn's (1817) entry for this species reads nhabits the coasts of the Falkland Islands, Favanne. Tranquebar, Chemnitz'. It seems that the alklands can be assumed to be the type locality and in order to obviate further confusion I nominate ese islands as type locality for the radially ribbed *Trochita* of that area.

rochita clypeolum Reeve

Trochita clypeolum Reeve, 1859, pl. 3, fig. 14.
Trochita clypeolum Rochebrune & Mabille, 1889, vi, p. 37.
Calyptraea costellata form *clypeolum* Melvill & Standen, 1907, p. 100.
Calyptraea costellata clypeolum Strebel, 1906, p. 159, pl. 13, fig. 93*a*, *b*.

Type locality. Strait of Magellan.

St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 115 m.
St. 1321. From 4 miles S 72° W to 5·6 miles S 75° W of East Tussac Rock, Cockburn Channel, Tierra del Fuego, 16 Mar. 1934, 66 m.
St. WS 85. 8 miles S 66° E of Lively I., East Falkland Is., 25 Mar. 1927, 79 m.
St. WS 86. Burdwood Bank, 53° 53′ S, 60° 34′ 30″ W, 3 Apr. 1927, 151 m.
St. WS 92. Between Falkland Is. and Patagonia, 51° 58′ 30″ S, 65° 01′ W, 8 Apr. 1927, 145–143 m.
St. WS 93. 7 miles S, 80° W of Beaver I., West Falkland Is., 9 Apr. 1927, 133 m.
St. WS 97. North-west of Falkland Is., 49° 00′ 30″ S, 61° 58′ W, 18 Apr. 1927, 146 m.
St. WS 214. North of Falkland Is., 48° 25′ S, 60° 40′ W, 31 May 1928, 208 m.
St. WS 221. Off East Patagonia, 48° 23′ S, 65° 10′ W, 4 June 1928, 76 m.
St. WS 231. North of Falkland Is., 50° 10′ S, 58° 42′ W, 4 July 1928, 167–159 m.
St. WS 237. North of Falkland Is., 46° S, 60° 05′ W, 7 July 1928, 150 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.
St. WS 244. West of Falkland Is., 52° S, 62° 40′ W, 18 July 1928, 253 m.
St. WS 871. North of Falkland Is., from 50° 29′ S, 58° 52′ W to 50° 31′ S, 58° 48′ W, 6 Nov. 1931, 148 m.
St. WS 813. Off East Patagonia, 51° 35′ 15″ S, 67° 16′ 15″ W, 13 Jan. 1932, 106–102 m.
St. WS 818. West of Falkland Is., 52° 30·5′ S, 63° 27′ W, 17 Jan. 1932, 278–285 m.

rochita georgiana n.sp., Pl. VII, fig. 22

Shell small, white, smooth except for irregular concentric growth wrinkles, and covered with a thin le buff epidermis which slightly overlaps the peristome. Conical, of circular outline, with the apex most central. Protoconch of $1\frac{1}{2}$ loosely wound, rapidly increasing whorls, first smooth with a median unt keel but later developing five spiral ribs, two above and three below the keel. The actual apex is ightly excavated. The protoconch and succeeding whorl form a narrow dome-shaped spire in relation the last whorl, which is more spread. The shell is very similar to that of *clypeolum* except for the tline of the septum, which is only weakly sigmoid, the outer sinus being only slightly developed. It approaches the New Zealand genus *Zegalerus*, which is of similar shape but has an even more simplifie septum which is merely shallowly concave.

Dentition. The paired marginals are plain as in *trochiformis*, but the main cusp on both the centr and laterals is much weaker.

Height 7·5 mm.; diameter 12·5 mm. (holotype).

Type locality. St. 160. Near Shag Rocks, West of South Georgia, 53° 43′ 40″ S, 40° 57′ W 7 Feb. 1927, 177 m.

St. 27. West Cumberland Bay, South Georgia, 3·3 miles S 44° E of Jason Lt., 15 Mar. 1926, 110 m.
St. 140. Stromness Harbour to Larsen Point, South Georgia, 23 Dec. 1926, 122–136 m.
St. 152. North of South Georgia, 53° 51′ S, 36° 18′ 30″ W, 17 Jan. 1927, 245 m.
St. 156. North of South Georgia, 53° 51′ S, 36° 21′ 30″ W, 20 Jan. 1927, 200–236 m.
St. 159. North of South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.
St. WS 33. Off south end of South Georgia, 54° 59′ S, 35° 24′ W, 21 Dec. 1926, 130 m.

Family STRUTHIOLARIIDAE

Genus **Perissodonta** Martens, 1878

Type (monotypy): *Struthiolaria mirabilis* Smith, 1875, Recent, Kerguelen I.
=*Struthiolarella* Steinmann & Wilckens, 1908
Type (o.d.): *Struthiolaria ameghinoi* v. Ihering, Oligocene, South America

Members of the Struthiolariidae are restricted to southern lands, and their distribution can b accounted for only by an assumed former closer unity of these lands, either in the shape of the earl Gondwanaland Continent of geologists, or by an enlarged Antarctica with northern radial extension

The family was already well developed in the Upper Cretaceous of both Patagonia and New Zealan in the form of the gerontic genus *Conchothyra*, which shows relationship with the more widely distribute Aporrhaidae.

In the Tertiary the Struthiolariidae were represented in Patagonia by *Struthiolarella* (which seems t equal the Recent *Perissodonta*), in New Zealand by a series of genera, *Monalaria*, *Struthiolari* *Callusaria* and *Pelicaria*, and in southern Australia by *Tylospira*.

The distribution of living members of the family is as follows: South Georgia (*Perissodonta*, on species), Kerguelen Island (*Perissodonta*, one species), New Zealand (*Struthiolaria* and *Pelicaria*, on species and a subspecies of each) and south-eastern Australia (*Tylospira*, one species).

Marwick (1924), in his excellent monograph of the Struthiolariidae, referred the Kerguelen specie to *Struthiolarella* and omitted reference to Marten's *Perissodonta*. This genus was again overlooked b Finlay & Marwick (1937, p. 15), when a further valuable contribution was made to the phylogeny of th family.

In the light of the adult characteristics of *Perissodonta*, revealed below for the first time by th production of South Georgian examples with a fully grown, deeply sinused peristome, it seems certai that the South American Oligocene? *ornata* (Sowerby) is identical with the recent *P. georgiana*. Bot species are presumed to be close to their respective genotypes.

Unfortunately, there are no well-preserved apices in the several South Georgian examples, bu opercular and radular characters were noted.

The operculum in *P. georgiana* is elongated leaf-shaped with an attenuated terminal nucleus an a median sharply defined sulcus. In both *Struthiolaria papulosa* and *Pelicaria vermis* the operculum shaped like a reversed comma, for it is oval, but with a narrow hooked terminal nucleus. In *papulos* there are several radial planes, but these are ill defined (exaggerated in the text figure) compared wit deep sulcus in *georgiana*. In *vermis* there are no radial planes, just a slight strengthening rib along lower inner margin (Fig. N, 120, 121, p. 196).

I have not seen the operculum of *Perissodonta mirabilis*, but Smith's figure (1877, pl. fig. 3*a*) shows rominent hook, but this may have been due to warping of the operculum in drying and the breaking ay of the lower outer margin. However, a significant similarity to the *georgiana* operculum is the dian sulcus which is clearly shown in Smith's figure.

Some interesting points arise from study of the dentition of three of the Recent genera: *Struthiolaria*, *icaria* and *Perissodonta* (Fig. I, 35–37, p. 191). First, *Struthiolaria* and *Pelicaria*, as one would expect, w closer alliance to each other than either do to *Perissodonta*, which stands apart by the duplication ts marginals to four or five teeth and the erect, narrowly triangular shape of the laterals as opposed to rectangular outline of these teeth in both *Struthiolaria* and *Pelicaria*. The triangular-shaped lateral of *rissodonta* approaches that of *Aporrhais*, and this feature, coupled with that of the deep labial sinus, kes the derivation of the Struthiolariidae from the Aporrhaidae a very reasonable assumption.

Duplication of marginals is evidently an archaic stable feature of *Perissodonta*, for it occurs in the r examples of *georgiana* studied, one of which was prepared by Mr John Morton of Auckland iversity College, who first drew my attention to this fact. Fischer (1884, Text-fig. 442) gives urious rendering of the radula of the Kerguelen *P. mirabilis* (as *Struthiolaria costulata* Martens), in ich the laterals and marginals are drawn in an unnaturally erect position, but the essential points, pairs of marginals and tall narrow laterals, are shown.

In *Perissodonta georgiana* all the teeth are denticulate to some degree. The central has blunt, irregular ticles that vary greatly even from tooth to tooth in the same radula. The lateral has a broadly rounded minal cusp followed by a series of denticles, the innermost marginal is intermediate between the ral and the slender marginals and bears ten to twelve small but regular denticles, while the outer rginals have only weak serrations towards their blunt, narrowly rounded extremities.

Although both *Struthiolaria* and *Pelicaria* have normal taenioglossid paired marginals and almost ntical rectangular laterals, the central tooth is distinctive for each genus. That of *Struthiolaria* is are-based with a multiserrate, broadly triangular cutting edge that does not extend to half the depth he base. That of *Pelicaria* is oblong, more broad than deep, but has a very large narrowly triangular rated cusp that extends far below the base. In *Pelicaria* both marginals are plain, but in *Struthiolaria* inner one is weakly denticulate on its lower inner margin. Unfortunately, the dentition of *Tylospira* ot known.

issodonta georgiana Strebel, Pl. VIII, figs. 40–42.

Perissodonta mirabilis georgiana Strebel, 1908, p. 46, pl. 3, figs. 33*a*, *b*, *c*.

TYPE LOCALITY. Cumberland Bay, South Georgia, 252–310 m.

St. 1941. Leith Harbour, South Georgia, 29 Dec. 1936, 38 m.
St. WS 33. Off Southern end of South Georgia, 54° 59′ S, 35° 24′ W, 2 Dec. 1926, 130 m.
St. WS 62. Wilson Harbour, South Georgia, 19 Jan. 1927, 26–83 m.

DENTITION. Fig. I, 35, p. 191, *georgiana*; Fig. I, 36, *Struthiolaria papulosa*, Takapuna, Auckland, w Zealand; Fig. I, 37, *Pelicaria vermis*, Auckland Harbour, New Zealand.

OPERCULUM. Fig, N, 120, *georgiana*; Fig. N, 122, *Struthiolaria papulosa*, Fig. N, 121, p. 196, *icaria vermis*.

Family CYMATIIDAE

Genus **Fusitriton** Cossman 1903

Type (o.d.): *Triton cancellatum* Lamarck = *Cyrotritonium* Martens 1903, Type *Lampresia murrayi* Smith = *Priene* of Cossmann, 1906, *non* H. & A. Adams, 1858

Fusitriton cancellatum (Lamarck)

Murex magellanicus Chemnitz, 1788, p. 275, pl. 184, fig. 1570 (non binom.).
Triton cancellatum Lamarck, 1822, p. 187.
Triton cancellatum Lamarck, 1845, p. 638.
Fusus cancellatus Reeve, 1848, pl. 16, fig. 62.
Priene magellanica Rochbrune & Mabille, 1889, p. H 42.
Triton cancellatus Strebel, 1905*b*, p. 647, pl. 23, fig. 50*a–e*.
Triton cancellatum (Gay) Hupé, 1854, p. 182.
Triton cancellatus Tryon, 1881, p. 34, pl. 16, fig. 164.

TYPE LOCALITY. Strait of Magellan.

St. WS 71. 6 miles N 60° E of Cape Pembroke Lt., East Falkland Is., 51° 38′ 00″ S, 57° 32′ 30″ W, 23 Feb. 1927, 82–80 m.
St. WS 80. Between Falkland Is. and Patagonia, 50° 58′ 00″ S, 63° 39′ 00″ W to 50° 55′ 30″ S, 63° 36′ 00″ W, 14 Mar. 1927, 152–156 m.
St. WS 83. 14 miles S 64° W of George I., East Falkland Is., 24 Mar. 1927, 137–129 m.
St. WS 85. 8 miles S 66° E of Lively I., East Falkland Is., 52° 09′ 00″ S, 58° 14′ 00″ W to 52° 08′ 00″ S, 58° 09′ 00″ W, 25 Mar. 1927, 79 m.
St. WS 109. North of Falkland Is., 50° 19′ 00″ S, 58° 27′ 00″ W to 50° 18′ 36″ S, 58° 30′ 00″ W, 26 Apr. 1927, 145 m.
St. WS 225. North-west of Falkland Is., 50° 20′ 00″ S, 62° 30′ 00″ W, 9 June 1928, 162–161 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ 00″ S, 64° 30′ 00″ W, 17 July 1928, 144–141 m.
St. WS 250. North-east of Falkland Is., 51° 45′ 00″ S, 57° 00′ 00″ W, 20 July 1928, 251–313 m.
St. WS 756. North of Falkland Is., 50° 53′ S, 60° 00′ W, 10 Oct. 1931, 118–90 m.
St. WS 799. North-west of Falkland Is., 48° 04′ 15″ S, 62° 48′ 07″ W, 21 Dec. 1931, 141–137 m.
St. WS 804. North-west of Falkland Is., 50° 23·5′ S, 62° 47′ W, 6 Jan. 1931, 143–150 m.
St. WS 866. Between Falkland Is. and Patagonia, 50° 36′ S, 64° 15′ W to 50° 39·5′ S, 64° 15′ W, 29 Mar. 1932, 137–144 m. (juvenile dead shells).
St. WS 867. Between Falkland Is. and Patagonia, 51° 10′ S, 64° 15·5′ W, 30 Mar. 1932, 150–147 m. (half-grown dead shells).
St. 222. St. Martin's Cove, Hermit I., Cape Horn, 23 Apr. 1927, 30–35 m.

RANGE. Magellan and Falkland I. Watson (1886) recorded *cancellatum* from off Marion I., 46° 48′ S, 37° 49′ 30″ E, 69 fathoms. I have not seen this specimen, but it most likely represents a new species.

The finding of numerous examples of this species from a range of stations around the Falkland Islands is of interest, as the species has not hitherto been recorded from this locality. These new records are probably due to the fact that the Discovery Committee's 'William Scoresby' used the otter-trawl extensively in these waters, thus covering a far greater area and securing large, sparsely distributed, species, which previously had only been obtained in small specimen dredges by the merest chance.

The known distribution of the genus is now as follows (See Figs. A and B):

cancellatum (Lamarck 1822): Strait of Magellan; Tierra del Fuego; South Patagonia and Falkland Islands to Patagonia in 30-251 m.;
scaber (King & Broderip, 1831): Valparaiso, 7–45 fathoms to Bolivia (Tryon);
rudis (Broderip, 1833): Chile to Peru (Tryon, Rochebrune & Mabille, 1889);
oregonensis (Redfield, 1848): San Diego, California, Bering Sea and Japan;

murrayi (Smith, 1891): South Africa, off Cape of Good Hope, 150 fathoms and Agulhas Bank, fathoms;

aurora Hedley (1916): Off South Australia, 35° 55′ 30″ S, 134° 18′ 00″ E, 1800 fathoms;

retiolum (Hedley, 1914): Off Green Cape and Gabo Island, New South Wales, Australia, 50–100 thoms;

laudandum Finlay (1926): New Zealand, Otago Heads, 40 fathoms (type); Auckland Islands; Ninety ile Beach, North Auckland.

With these additional records for the genus the probable routes of dispersal become more evident. hus the western coasts of the Americas are considered to have extended the range of this southern nus to the North Pacific via California, Alaska, the Aleutian Chain and thence southward to Japan. he Australian and New Zealand occurrences no doubt had their origin in the Subantarctic rather than a further southward extension from Japan. The 'Challenger' record ascribed to *cancellatus* from arion Island is strongly suggestive of the former supposition. This and the South African occurrence dicate an Atlantic-Indian Ocean cross-ridge source which is supported by the recently reported currence in South African waters of *Parmaphorella* and *Glypteuthria*, both of which are characteristic agellan genera (see Tomlin, 1932, pp. 163–4).

THE BUCCINACEA

The whelks are a vigorous, highly plastic group of world-wide range, but especially diversified in the lar regions of both hemispheres.

In 1929 (pp. 57–9) I proposed a classification based largely upon radula and opercula characters, and lvocated the use of four families: the Buccinidae, Neptuniidae, Buccinulidae and Cominellidae. Further nsideration, however, indicated that the classification I proposed is not nearly so clear-cut as could desired. Thiele (1929, pp. 305–19) grouped all the genera, covered in the following discussion, in the uccinidae without the use of either subfamilies or sections.

However, none of the antarctic and subantarctic whelks appears to have much in common with the rthern *Buccinum*, which has an ovate operculum with a median submarginal nucleus, and a radula ith more than three cusps on both the central and lateral teeth. The southern whelks have the erculum either leaf-shaped with a terminal nucleus or ovate with a paucispiral subterminal nucleus. hey appear therefore to be derivatives of the Neptuniidae rather than of the Buccinidae.

Considerable radiation in form has taken place in the southern whelks, making necessary the employ- ent of a series of genera. Not one of these genera, however, is closely similar to *Neptunea*, and I prefer consider them members of a characteristic southern family, the Buccinulidae. The chief characteristics the Buccinulidae are the tricuspid central tooth and an operculum with a terminal or subterminal ucleus. Diversity in the form of the lateral teeth, however, suggests the following subfamily grouping:

A. Cominellinae (central tooth tricuspid, lateral teeth bicuspid). *Pareuthria*, *Tromina*, *Notoficula*, *alsimohnia** and *Glypteuthria*.* Correlatives are *Cominella* and *Fax*, New Zealand and Australia, *hos*, tropical Pacific and *Searlesia*, North-west America.

B. Buccinulinae (central and lateral teeth tricuspid). *Chlanidota*, *Pfefferia*, *Neobuccinum*, *Pro-ccinum*, *Cavineptunea* and *Bathydomus*. In the last mentioned, the central tooth has an incipient cusp n each side of the central three and the middle cusp of the laterals is split into two or three small cusps. he sum of characters, however, indicates the genus as a near ally of *Chlanidota*. Correlatives are *uccinulum*, *Aeneator* and *Verconella*, New Zealand, *Austrosipho* and *Berylsma*, Australia, and *Kelletia*, alifornia.

* In *Falsimohnia* the central tooth has the cusps reduced to one and in *Glypteuthria* a third incipient cusp on the laterals sults from bifurcation; otherwise they closely resemble *Pareuthria*.

C. Prosiphiinae (central tooth tricuspid, lateral teeth multicuspid). Typically, the laterals have a long basal projection, like a handle; without this projection but with lateral denticles, in *Proneptunea*; and combining the features of basal projection and lateral denticles, but minus the central tooth in *Meteuthria*, *Prosipho*, *Anomacme*, *Fusinella*, *Meteuthria*, *Proneptunea* and *Chlanidotella*. The *Prosipho* radula, including its variations, does not appear to occur outside Antarctic and Subantarctic seas.

The above arrangement is provisional only and is probably more convenient than real. It is advanced, however, as a step towards the unravelling of the complexity of southern Buccinoid development.

There is no reason why we should look for the origin of these shells from outside the Southern Ocean, for they could have developed in that region concurrently with the northern Buccinidae and Neptuniidae, a common ancestry being assumed in the geological past. It would seem that *Searlesia* (the West American *dira*) and *Kelletia* are both invading Buccinulidae from the south and conversely that the South African *Burnupena* is a true member of the northern Buccinidae.

In this connexion the present distribution of *Fusitriton* demonstrates the effectiveness of the continuity of the Americas with the Scotia Arc, and the Atlantic-Indian Ocean cross-ridge in giving that genus a bipolar circum-Pacific range.

Family BUCCINULIDAE

Subfamily COMINELLINAE

Genus **Pareuthria** Strebel, 1905

Type (s.d. Tomlin, 1932), *Fusus plumbeus* Philippi

A characteristic Subantarctic and Antarctic genus of small, elongately fusiform shells resembling *Euthria* and *Buccinulum* in shell features, but with bicuspid instead of tricuspid lateral teeth, which feature allies the genus with the Cominellinae. The protoconch is smooth and papillate, of about two whorls, and the operculum is leaf-shaped with a terminal nucleus.

The genus is best developed in the Magellan region, but extends eastwards to Campbell Island, New Zealand, and southwards to the Davis Sea.

Pareuthria fuscata (Bruguière)

Buccinum fuscatum Bruguière, 1789, p. 282.
Buccinum antarcticum Reeve, 1846, fig. 30.
Euthria antarctica Adams, 1858, p. 86.
Tritonium schwartzianum Crosse, 1861, p. 174, pl. 6, figs. 9, 10.
Fusus (*Euthria*) *fuscatus* Watson, 1886, p. 209.
Euthria fuscata Strebel, 1905*b*, p. 611, pl. 24, figs. 69–72, 74–79.
Euthria antarctica Lamy, 1905, p. 476.
Euthria fuscata Lamy, 1907, p. 2.
Euthria fuscata Melvill & Standen, 1907, p. 139.
Euthria (*Pareuthria*) *fuscata* Strebel, 1908, p. 28.
Euthria (*Pareuthria*) *fuscata* Melvill & Standen, 1914, p. 121.

TYPE LOCALITIES. ? (*fuscatum*); Falkland Is. (*antarcticum*).

St. 54. Port Stanley, East Falkland Is., 15 May 1926, Shore collecting.
St. 55. Entrance to Port Stanley, East Falkland Is., 2 cables S 24° E of Navy Point, 16 May 1926, 10–16 m.
St. 56. Sparrow Cove, Port William, East Falkland Is., 1½ cables N 50° E of Sparrow Point, 16 May 1926, 10½–16 m.
St. 58. Port Stanley, East Falkland Is., 19 May 1926, 1–2 m.

DENTITION. Fig. L, 69, p. 194.

RANGE. Strait of Magellan and Falkland Is.

reuthria magellanica (Philippi)

Buccinum magellanicum Philippi, 1848, p. 48, pl. 1, fig. 14.
Fusus rufus Hombron & Jacquinot, 1854, p. 107, pl. 25, fig. 3.
Euthria magellanica Strebel, 1905*b*, p. 601, pl. 24, figs. 57–68, 73.
Euthria magellanica Melvill & Standen, 1907, p. 109.
Euthria magellanica Strebel, 1908, p. 29.
Euthria (*Pareuthria*) *magellanica* Melvill & Standen, 1914, p. 121.

TYPE LOCALITY. Strait of Magellan.

St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 105–115 m.

Strebel (1905) recorded this from Port Stanley, 1 fathom, Falkland Islands and Melvill & Standen 914) from low water, Roy Cove, Falkland Islands. All the fifty-one 'Discovery' examples are empty ells and may have washed down from shallow waters.

The species is not distinctive and may be only a smooth variation of *fuscata*.

areuthria plumbea (Philippi)

Fusus plumbeus Philippi, 1844, p. 108.
Euthria plumbea Strebel, 1905*b*, p. 600, pl. 24, figs. 52–54.
Euthria (*Pareuthria*) *plumbea* Strebel, 1908, p. 28.

TYPE LOCALITY. Strait of Magellan.

St. 724. Fortescue Bay, Magellan Strait, 16 Nov. 1931, 0–5 m.

areuthria rosea (Hombron & Jacquinot)

Fusus roseus Hombron & Jacquinot, 1854, p. 107, pl. 25, figs. 4, 5.
Euthria rosea Rochebrune & Mabille, 1889, p. 59.
Euthria rosea Strebel, 1905*b*, p. 616, pl. 21, figs. 1–4.
Euthria (*Pareuthria*) *rosea* Strebel, 1908, p. 28.
Euthria rosea Melvill & Standen, 1912, p. 355.

TYPE LOCALITY. Strait of Magellan.

St. 48. 8·3 miles N 53° E of William Point Beacon, Port William, Falkland Is., 3 May 1926, 115 m.
St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles, N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 105–115 m.
St. WS 92. Between Falkland Is. and Patagonia, 52° S, 65° W to 51° 57′ S, 65° 02′ W, 8 Apr. 1927, 145–143 m.
St. WS 94. Between Falkland Is. and Patagonia, 50° S, 65° W to 50° 00′ 30″ S, 64° 55′ 30″ W, 16 Apr. 1927, 110–126 m.
St. WS 797. Off Cape Blanco, Patagonia, 19 Dec. 1931, 117 m.
St. WS 867. Between Falkland Is. and Patagonia, 51° 10′ S, 64° 15·5′ W, 30 Mar. 1932, 150–147 m.
St. WS 869. Between Falkland Is. and Patagonia, 52° 15′ 30″ S, 64° 13′ 45″ W, 31 Mar. 1932, 187–201 m.

areuthria ringei (Strebel)

Euthria ringei Strebel, 1905*b*, p. 619, pl. 21, fig. 5*a–c*.

TYPE LOCALITY. Strait Le Maire, between Staten I. and Tierra del Fuego.

St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m. (numerous well-preserved empty shells).
St. WS 86. Burdwood Bank, south of Falkland Is., 53° 53′ 30″ S, 60° 34′ 30″ W, 3 Apr. 1927, 151 m.

RANGE. Also recorded by Strebel (1905, loc. cit.) from Puerto Gallegos, east coast of Patagonia.

Pareuthria michaelseni (Strebel)

Euthria michaelseni Strebel, 1905*b*, p. 621, pl. 21, fig. 6*a*, *b*.
Euthria michaelseni Melvill & Standen, 1907, p. 109.
Euthria (*Pareuthria*) *michaelseni* Strebel, 1908, p. 28.
Euthria (*Pareuthria*) *michaelseni* Melvill & Standen, 1914, p. 121.

Type locality. Smyth Channel, Strait of Magellan.

St. WS 71. 6 miles N 60° E of Cape Pembroke, Lt., East Falkland Is., 51° 38′ S, 57° 32′ 30″ W, 23 Feb. 1927, 82 m.
St. WS 80. North-west of Falkland Is., 50° 58′ S, 63° 39′ W to 50° 55′ 30″ S, 63° 36′ W, 14 Mar. 1927, 152–156 m.
St. WS 88. Off Tierra del Fuego, 54° S, 65° W to 54° S, 64° 55′ W, 6 Apr. 1927, 118 m.
St. WS 97. North-west of Falkland Is., 49° S, 62° W to 49° 01′ S, 61° 56′ W, 18 Apr. 1927, 146–145 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.
St. WS 804. North-west of Falkland Is., 50° 22′ 45″ S, 62° 49′ W, 6 Jan. 1932, 143–150 m.

This is a slender, finely striated shell of light chestnut colour, relieved by a narrow white peripheral band on the body-whorl.

Pareuthria paessleri (Strebel)

Euthria paessleri Strebel, 1905*b*, p. 625, pl. 21, fig. 9*a*, *b*.

Type locality. Smyth Channel, Strait of Magellan.

St. WS 834. Near eastern entrance to Strait of Magellan, 2 Feb. 1932, 27–28 m.

This species has a distinct submargined suture and spiral striations on the base only.

Pareuthria scalaris (Watson)

Fusus (*Sipho*) *scalaris* Watson, 1882, p. 377.
Fusus (*Neptunea*) *scalaris* Watson, 1886, p. 203, pl. 12, fig. 5.
Probuccinum scalare Thiele, 1912, p. 263.

Type locality. 47° 48′ 30″ S, 70° 47′ W, north-west Patagonia, 125 fathoms.

St. WS 80. North-west of Falkland Is., 50° 57′ S, 63° 37′ 30″ W, 14 Mar. 1927, 152–156 m.
St. WS 237. North of Falkland Is., 46° S, 60° 05′ W, 7 July 1928, 150–256 m.
St. WS 804. North-west of Falkland Is., 50° 22′ 45″ S, 62° 49′ W, 6 Jan. 1932, 143–150 m.

Pareuthria venustula n.sp., Pl. VI, fig. 17

Shell narrowly fusiform with a tall spire and short canal, very thin, semi-transparent, dull white and without colour markings. Whorls 6½, moderately convex but slightly excavated below the suture. Protoconch smooth and glossy, papillate of 2½ whorls, the apex flattened, tilted and slightly immersed. Post-nuclear whorls delicately and densely spirally lirate, eighteen to twenty-six lirations on the spire-whorls and about fifty-two on the body-whorl. There are numerous slightly sinuous and irregularly disposed axial growth lines. The neck of the canal is smooth except for weak axial growth lines. Spire one and a third times height of aperture plus canal. Aperture simple without internal lirations or denticles. Outer lip thin. Basal sinus broad and shallow.

Height 13·3 mm.; diameter 5·9 mm. (holotype).

Type locality. St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09″ W, 16 April 1930, 121 m. (one living example and several well-preserved empty shells).

Dentition. Fig. L, 70, p. 194. Typical, with tricuspid central and bicuspid lateral teeth.

Genus Tromina Dall, 1918

Type (o.d.): *Fusus unicarinatus* Philippi, Strait of Magellan

This generic name was provided on the basis of a few empty shells from the Strait of Magellan in fathoms, and although comparisons with the Neptuniidae were made by Dall (1902) he considered genus to be Trophonoid (Dall, 1902*b*, p. 536).

In 1925 Dall (pl. 21, fig. 7) figured the species for the first time, showing a strongly keeled shell very nilar to a new species from Clarence Islands, 61° 25′ 30″ S, 53° 46′ W, which proves to be Cominellid se to *Pareuthria*.

These shells have a relatively large, dome-shaped protoconch with a smooth, blunt nucleus, but later veloping brephic axial threads and fine spiral striae. The operculum is horny, ovate and paucispiral, cupying about half the area of the aperture, and the radula has a tricuspid central tooth and bicuspid erals. The radula resembles that of *Pareuthria* except for the form of the laterals, which have the sps set closer together, the inner one massive and incurved. A similar style of radula occurs in the ecies *Notoficula problematica* n.sp., described following.

I have included in *Tromina* a group of smaller Magellan species with rounded whorls and numerous gular spiral cords, crossed by weak axial threads, but they lack the prominent keels of both the genope and the Clarence Island *tricarinata*. The protoconch, operculum and radula, however, are similar those features in the typical species, Fig. N, 103, 126, p. 196.

romina tricarinata n.sp., Pl. X, figs. 64, 65

Shell small, dull white, biconic, the body-whorl with three strong spiral keels. Whorls five, including large, blunt, dome-shaped protoconch of two whorls, the first smooth and almost flat-topped, the cond with numerous fine crisp axial threads and dense microscopic spiral striae. First post-nuclear horls with a prominent, bluntly rounded, median keel, the penultimate with a second keel emergent the lower suture and the body-whorl with three keels. Outline of shell strongly concave on the oulder, between the keels and below the lowest keel on the base. Surface delicately reticulated by ense axial and spiral threads. The spirals, which are slightly stronger than the axials, number about urteen on the shoulder of the body-whorl, five on the rounded keels, nine to eleven between the keels d about thirty below the lowest keel. Spire less than height of aperture plus canal. Aperture produced elow into a short open spout-like canal. Outer lip thin, columella strongly incurved above and spirally exed below. Operculum small, occupying about half the area of the aperture, ovate, thin, horny and aucispiral, the nucleus subterminal and on the inner side.

Height 13·5 mm.; diameter 8·5 mm.

TYPE LOCALITY. St. 170. Off Cape Bowles, Clarence Is., 61° 25′ 30″ S, 53° 46′ W, 23 Nov. 1927, 42 m.

DENTITION. Fig. L, 71, p. 194.

romina fenestrata n.sp., Pl. VI, fig. 14

Shell small, white, squat, sculptured with numerous sharply raised spiral cords, crossed by fine, risp, axial threads which render the cords weakly gemmulate. Whorls weakly shouldered by an extra trong cord situated just above the middle, 4½, including a large dome-shaped protoconch of 1½ whorls, mooth at first, but the last half-whorl with closely spaced minute axial threads and indistinct spirals. ll spire-whorls with six narrow, sharply raised spiral cords, number three from the top the strongest nd forming the peripheral angulation. Body-whorl with twenty spiral cords, more closely spaced over he middle of the base, and including five on the neck. The axial threads number about forty-five on the body-whorl, and in addition there is an interstitial surface sculpture of dense microscopic axial threads. Aperture as in the other species except for a peripheral angulation of the outer lip.

The epidermis is so thin and transparent that it is scarcely apparent. Operculum ovate, paucispiral, occupying slightly more than half the area of the aperture.

Height 6·0 mm.; diameter 4·0 mm. (holotype).

TYPE LOCALITY. St. WS 766. Between Falkland Is. and Argentina, 45° 13′ S, 59° 56′ 30″ W, 18 Oct. 1931, 545 m.

Tromina bella n.sp., Pl. VI, fig. 16

Shell small, ovate, squat, with broadly rounded whorls, evenly sculptured with moderately strong rounded spiral cords and covered with a thin, pale buff epidermis. Whorls 4½, including a blunt, dome-shaped protoconch of 1½ whorls, the tip smooth, followed by a whorl of weak axial threads, becoming more distinct over the last half-whorl which has the addition of weak spiral threads. First and second post-nuclear whorls with seven rounded spiral cords, penultimate with eight and body-whorl with about thirty, ten of which are on the neck. The whole surface is crowded with dense axial threads which render weakly gemmulate some of the spiral cords of the shoulder. Aperture ovate-pyriform with a short open canal. Outer lip thin, columella straight medially and spirally flexed below. Parietal callus weak, shining white with the spiral sculpture showing through towards the outer edge. Operculum ovate, paucispiral, occupying about half the area of the aperture.

Height 7·4 mm.; diameter 5·0 mm. (holotype, St. 817).

TYPE LOCALITY. St. WS 817. Between Falkland Is. and Patagonia, 52° 28′ S, 64° 19′ W, 14 Jan. 1932, 191–202 m.

St. WS 212. North of Falkland Is., 49° 22′ S, 60° 10′ W, 30 May 1928, 242–249 m.
St. WS 244. West of Falkland Is., 52° S, 62° 40′ W, 18 July 1928, 253–247 m.
St. WS 816. Between Falkland Is. and Patagonia, 52° 09′ 45″ S, 64° 56′ W, 14 Jan. 1932, 150 m.
St. WS 818. Between Falkland Is. and Patagonia, 52° 31′ 15″ S, 63° 25′ W, 17 Jan. 1932, 272–278 m.

DENTITION. Fig. L, 72, p. 194 (St. WS 818). PROTOCONCH. Fig. N, 104, p. 196.

Tromina simplex n.sp., Pl. VI, fig. 15

Shell small, ovate, squat with lightly convex whorls sculptured with dense spiral threads. Whorls 4½, including a blunt dome-shaped protoconch of 1½ whorls, smooth at first but sculptured with closely spaced axial and spiral threads over the last half-whorl. First and second post-nuclear whorls with ten spiral threads, penultimate with sixteen and body-whorl plus neck with about fifty. Surface crowded with very weak axial growth lines. Aperture ovate-pyriform with a short open canal. Outer lip thin. Columella straight medially and spirally flexed below. Parietal callus smooth, sharply marked off from the sculptured body-whorl.

Height 7·25 mm.; diameter 4·25 mm. (holotype, St. WS 237).

TYPE LOCALITY. St. WS 237, north of the Falkland Is., 46° S, 60° 05′ W, 7 July 1928, 150–256 m.

St. WS 216. North of the Falkland Is., 47° 37′ S, 60° 50′ W, 1 June 1928, 219–133 m.

The species is easily distinguished from *bella* by its much less inflated sagging whorls and much finer and denser spiral sculpture. No living examples were obtained, but the style of apex renders reference to *Tromina* almost certain.

Genus **Notoficula** Thiele, 1917

n.nom. for *Ficulina* Thiele, 1912, non Gray, 1867

Type: *Ficulina bouveti* Thiele

Thiele (1912, p. 270, pl. 19, fig. 13) based this genus upon a small 'Ficus'-shaped shell from Bouvet and, which he first placed subgenerically under *Cominella* and later (1929, p. 315) as a section of *lanidota*.

Living examples, possibly not fully adult, of what appears to be an allied species are described below. If my reference of these shells to *Notoficula* is correct, then that genus is indicated as allied to *reuthria* and quite close to *Tromina*. These shells have a tricuspid central tooth and bicuspid laterals, t the laterals are distinct from those of *Pareuthria* in that the two cusps are set much closer together d the inner one is the more robust. Also the inner cusp is strongly incurved with a deeply concave ner margin. The protoconch is dome-shaped and smooth, and the operculum ovate to D-shaped, ucispiral, with the nucleus near to the lower inner margin, Fig. N, 125.

otoficula problematica n.sp., Pl. VI, fig. 18

Shell small, ovate, white, few whorled, surface regularly incised with spiral linear grooves. Whorls $3\frac{3}{4}$, cluding a relatively large, smooth, dome-shaped protoconch of $1\frac{3}{4}$ whorls. Spire less than half ight of aperture. Sculpture of post-nuclear whorls in the form of regularly spaced linear grooves, hich cut the surface into low, flat-topped spiral cords, nine on the penultimate and about thirty on the dy-whorl. The whole surface is crossed by dense axial threads, more conspicuous in the grooves. perture ovate-pyriform, outer lip thin with a broad open anterior canal, neither produced nor nused, but partially constricted by a callused fold at the base of the pillar. Parietal wall deeply concave edially, but not excavated, covered with a thin callus. Operculum much smaller than the aperture, rny, ovate to D-shaped, paucispiral, the nucleus near to the lower inner margin.

Height 5·25 mm.; diameter 3·6 mm. (holotype).

Height 6·9 mm.; diameter 5·0 mm. (St. WS 766, a worn shell, probably adult).

Type locality. St. WS 766. Between Falkland Is. and Argentina, 45° 13′ S, 59° 56′ 30″ W, 8 Oct. 1931, 545 m.

Dentition. Fig. K, 61, p. 193. Operculum. Fig. N, 125, p. 196.

The material upon which this species is based may not be fully adult, but it is certainly distinct from he larger *bouveti*, which is of more pyriform outline and has less conspicuous spiral sculpture.

Genus **Falsimohnia** n.g.

Type: *Buccinum albozonatum* Watson

This genus has a dentition of similar style to that of the Boreal genus *Mohnia* Friele, 1878, but on hell characters the relationship is much more in accord with *Pareuthria* or *Glypteuthria*. Both *Mohnia* nd *Falsimohnia* have the central tooth with a single cusp and bicuspid laterals. The reduction of the usps of the central tooth to a single member also occurs in the Mediterranean *Chauvetia* (= *Lachesis* Risso), and this fact no doubt influenced Martens & Thiele in their placing of *Lachesis australis* (1903, . 62).

I would consider *Falsimohnia* as a derivative of *Pareuthria* in which the normal three cusps of the entral tooth have been reduced to a single member. There is a parallel case in the Naticoid genus *Tanea*, which has a central tooth with only one cusp, whereas most other genera of the family are ricuspid. Also the operculum of *Falsimohnia* has a blunt terminal nucleus as in *Pareuthria*, whereas n *Mohnia* it is ovate and paucispiral.

Falsimohnia albozonata (Watson)

Buccinum albozonatum Watson, 1882, p. 358.
Buccinum albozonatum Watson, 1886, p. 212, pl. 13, fig. 7.
Mangelia antarctica Martens & Pfeffer, 1886, pl. 1, figs. 5*a*, *b*.
Lachesis? australis Martens & Thiele, 1903, p. 62, pl. 5, fig. 18.
Pareuthria albozonata Thiele, 1912, p. 244.
Pareuthria albozonata L. David, 1934, p. 128.

TYPE LOCALITIES. Royal Sound, Kerguelen I., 28 fathoms (*albozonatum*); South Georgia (*antarctica*); Kerguelen I. (*australis*).

St. 123. Off mouth of Cumberland Bay, South Georgia, from 4·1 miles N 54° E of Larsen Point to 1·2 miles S 62° W of Merton Rock, 15 Dec. 1926, 230–250 m.
St. 140. Stromness Harbour to Larsen Point, South Georgia, from 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W, 23 Dec. 1926, 122–136 m.
St. 149. Mouth of Cumberland Bay, South Georgia, from 1·15 miles N 76½° W to 2·62 miles S 11° W of Merton Rock, 10 Jan. 1927, 200–234 m.
St. WS 25. Undine Harbour (north), South Georgia, 17 Dec. 1926, 18–27 m.

DENTITION. Fig. K, 59 (St. 149); Fig. K, 60, p. 193 (after Marten's (1903) for *Lachesis? australis*).

OPERCULUM. Fig. N, 127, p. 196.

The shallow-water St. WS 25 example has the typical colour pattern—brownish with a median pale spiral band, but material from the deeper water stations is uniformly buff.

Genus **Glypteuthria** Strebel, 1905

Type (s.d. Tomlin 1932): *Euthria meridionalis* Smith

The shells of this genus differ from those of *Pareuthria* in having more obvious sculpture, composed of equally well-developed spiral and axial ribs. Thiele (1929, pp. 311–18) associated *Glypteuthria* and *Probuccinum*, but disassociated them from *Pareuthria*, which he made a subgenus of *Northia*. I cannot understand Thiele's action in doing this, for there is no evidence against the view that *Glypteuthria* is a strongly sculptured relative of *Pareuthria*, apart from the fact that the lateral teeth in *Glypteuthria* are not strictly bicuspid. In *Pareuthria* the laterals are bicuspid, but in *Glypteuthria meridionalis* bifurcation of the inner cusp results in a third incipient cusp, but this condition is not comparable with that of *Probuccium*, in which there are three strongly developed and evenly spaced cusps.

The distribution of *Glypteuthria*, previously considered Magellanic, is now known to extend to South African waters, i.e. *capensis* (Thiele, 1925, p. 179) *capensis** and *solidissima* (Tomlin, 1932, pp. 164–7). The Magellan species are *meridionalis* Smith, 1881, *kobelti* Strebel, 1905, and *acuminata* Smith, 1915.

Glypteuthria meridionalis (Smith)

Euthria meridionalis Smith, 1881, p. 29, pl. 4, fig. 6.
Euthria meridionalis Rochebrune & Mabille, 1889, p. 61.
Euthria (*Glypteuthria*) *meridionalis* Strebel, 1905*b*, p. 627, pl. 21, fig. 11*a*, *b*.
Glypteuthria meridionalis Thiele, 1912, pl. 13, fig. 6 and pl. 16, fig. 17.

TYPE LOCALITY. Portland Bay, St Andrew's Sound, 10 fathoms, Patagonia.

St. WS 834. Near eastern entrance to Strait of Magellan, 2 Feb. 1932, 27–38 m.

DENTITION. Fig. K, 58, p. 193 (after Thiele, 1912, loc. cit.).

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* Renamed *Glypteuthria sculpturata*, Tomlin (1945).

Subfamily BUCCINULINAE

Genus **Chlanidota** Martens, 1878

Type (monotypy): *Cominella* (*Chlanidota*) *vestita* Martens, Kerguelen Island

The genus is restricted to the Antarctic region, with a known range extending over the Weddell, nderby and Victoria quadrants. Only one species, the genotype, extends to as far north as the ntarctic Convergence.

The shell is very thin and is covered with a pilose epidermis. Anterior canal truncated, deeply otched, with a ridge-margined fasciole. Operculum disproportionately small for the size of the aperture, regularly ovate, horny, excentric, with the nucleus at the anterior margin (Figs. F and N, 129).

The radula is very uniform; it has a tricuspid central tooth with a broad excavated basal plate and tricuspid lateral on either side of it. Specific differentiation is most clearly shown in the respective hapes of the central tooth. The tricuspid laterals have the central cusp weak and situated close alongde the inner cusp suggesting bifurcation of the inner of two original cusps. However, the three lateral usps are now so stable a feature that *Chlanidota* is more naturally placed with the Buccinulinae than ith the Cominellinae. In fact *Chlanidota*, *Neobuccinum* and the next genus, *Pfefferia*, may well epresent a transitional stage between the short canalled Cominellids and the long canalled Buccinulids. Reference to the Buccinidae is even less appropriate as shown by radula and opercular characters as ell as from geographical considerations.

hlanidota vestita (Martens)

Cominella (*Chlanidota*) *vestita* Martens, 1878.
Chlanidota vestita Tryon, 1881, p. 201, pl. 79, fig. 391.
Neobuccinum vestitum Watson, 1886, p. 216.
Chlanidota vestita Smith, 1902, p. 203.
Cominella (*Chlanidota*) *vestita* Martens & Thiele, 1903, p. 63.
Cominella (*Chlanidota*) *vestita* Lamy, 1911 *a*, p. 63.

TYPE LOCALITY. Kerguelen Island, Subantarctic.

RANGE. Subantarctic, Kerguelen I., 88 m. (Martens); Antarctic, Cape Adare, 24–26 fathoms (Smith). have been unable to check the Cape Adare record with material.

hlanidota pilosa n.sp., Pl. VIII, figs. 29 and 30

Compared with the South Georgian *densesculpta*, the Bouvet Island species is more globose, the pire more depressed (telescoped) and the shoulder quite distinctive in being noticeably inrolled to more deeply incised suture. The sculpture also is more pronounced, consisting of less dense but tronger spiral threads.

Shell thin and fragile, white, covered with a light yellowish brown epidermis which develops dense hort bristles on all the spiral treads. Spire short, depressed, dome-shaped, 0·37 height of aperture. Twenty-one narrow, crisp spiral threads on penultimate and about fifty-seven on body-whorl. Spiral culpture weakly concellated by closely spaced finer axial threads. In *densesculpta* there are from hirty to thirty-six spiral threads on the penultimate. Anterior canal deeply notched. Fasciole well defined by arcuate growth lines, but not ridge-margined above as in *densesculpta*.

Height 25·5 mm.; diameter 20 mm. (St. 456, holotype *pilosa* n.sp.)
Height 34·5 mm.; diameter 24 mm. (holotype of *densesculpta*).
Height 30·0 mm.; diameter 20 mm. (St. 1941, *densesculpta*).

Dentition. Fig. L, 73, p. 194. The radula is very similar to that of *densesculpta* except that the cusp of the central tooth are closer together, more broadly triangular and the middle one is much larger tha the other two.

Operculum. Typical, horny, small for size of aperture, irregularly ovate, flattened along the lowe or anterior edge which is the nucleus. Aperture of shell 3·3 times height of operculum.

Type locality. St. 456. 1 mile east of Bouvet I., 18 Oct. 1930, 40–45 m. (one living example, th holotype, and one empty shell).

Chlanidota densesculpta (Martens) Pl. VIII, figs. 31–33

Cominella (*Chlanidota*) *densesculpta* Martens, 1885, p. 91.
Cominella (*Chlanidota*) *densesculpta* Martens & Pfeffer, 1886, p. 71, pl. 1, fig. 3*a–f*.
Chlanidota densesculpta Strebel, 1908, p. 33.
Chlanidota densesculpta David, 1934, p. 128.

The species is quite variable in shape as shown by the following dimensions:
Height 31·0 mm.; diameter 20 mm. (Martens & Pfeffer).
Height 34·5 mm.; diameter 24 mm. (Martens & Pfeffer holotype).
Height 30·0 mm.; diameter 21 mm. (St. 1941), Pl. VIII, fig. 31.
Height 30·0 mm.; diameter 18 mm. (St. WS 62), Pl. VIII, fig. 32.
Height 40·0 mm.; diameter 23 mm. (St. WS 62), Pl. VIII, fig. 33.

Dentition. Fig. L, 75, p. 194. The radula is most like that of *pilosa* n.sp.

Type locality. South Georgia.

St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, 238–270 m.
St. 141. East Cumberland Bay, South Georgia, 200 yards from shore under Mt. Duse, 29 Dec. 1926, 17–27 m
St. 145. Stromness Harbour, South Georgia, between Grass I. and Tonsberg Point, 7 Jan. 1927, 26–35 m.
St. 1941. Leith Harbour, South Georgia, 29 Dec. 1936, 55–22 m.
St. WS 62. Wilson Harbour, South Georgia, 19 Jan. 1927, 15–45 m. and 26–83 m.
St. MS 6. East Cumberland Bay, ¼ mile south of Hope Point to 1¼ cables S×E of King Edward Point Lt 12 Feb. 1925, 24–30 m.
St. MS 10. East Cumberland Bay, ¼ mile south-east of Hope Point to ¼ mile south of Government Flagstaf 14 Feb. 1925, 26–18 m.

Range. Antarctic; South Georgia 0–270 m.; south-west of Snow Hill I., 64° 36′ S, 57° 42′ W, 125 m (Strebel, 1908). *Note:* Marten's 1903 Bouvet I. record of *densesculpta* is Thiele's *Notoficula bouve* (Thiele, 1912).

Chlanidota elongata (Lamy)

Cominella (*Chlanidota*) *vestita* var. *elongata* Lamy, 1910*b*, xvi, p. 319.
Cominella (*Chlanidota*) *vestita* var. *elongata* Lamy, 1911*a*, p. 6, pl. 1, fig. 6.

Type locality. Off King George I., South Shetlands, 420 m.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 60° 28′ 00″ W, 23 Feb. 1927, 342 m.
St. 175. Bransfield Strait, South Shetlands, 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.
St. 1952. Between Penguin I. and Lion's Rump, King George I, South Shetlands 11 Jan. 1937, 367–383 m.
St. 1957. Off South Side of Clarence I., South Shetlands, 7 miles east of Cape Bowles, 3 Feb. 1937, 785–810m

Range. Antarctic; South Shetlands, 200–810 m.

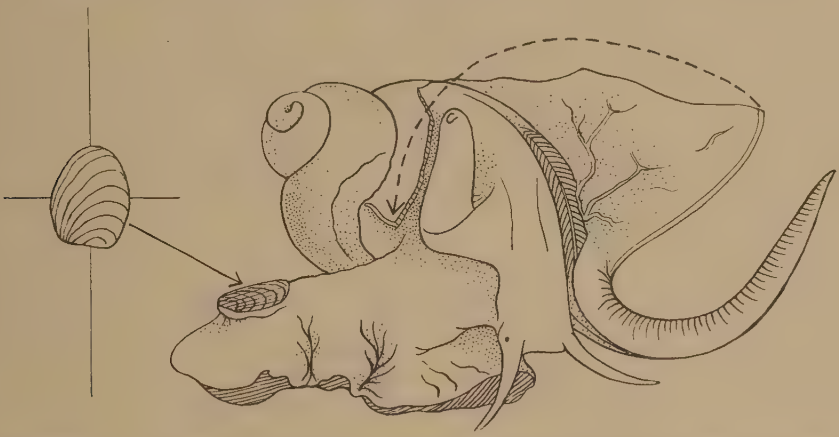
Dentition. Fig. L, 76, p. 194.

anidota signeyana n.sp., Pl. VIII, figs. 34, 35

'he species is closely allied to the South Shetlands *elongata* but is constantly broader and of ovate er than cylindrical outline.

hell thin and fragile, white, covered with a thin, pale buff epidermis. Spire tall for the genus, height of aperture. Whorls sculptured with moderately strong but narrow sharply raised spiral ls, ten to eleven on penultimate and twenty-three to twenty-six on the body-whorl, plus a few weak rmediates. Surface crossed by dense exceedingly fine axial growth lines. Anterior canal deeply hed; fasciole margined above by a sharply raised narrow ridge.

leight 38 mm.; diameter 24·5 mm. (holotype).
leight 32 mm.; diameter 21·0 mm. (paratype).
leight 29 mm.; diameter 19·0 mm. (paratype).
leight 32 mm.; diameter 19·0 mm. (*elongata*, St. 1952).
leight 28 mm.; diameter 16·5 mm. (*elongata*, St. 1952).



F. *Chlanidota signeyana*, n.sp. View of the whole animal with the mantle cut and folded back. Note the vestigial operculum, in relation to the size of the aperture (shown by crossed lines to the left).

ENTITION. Fig. L, 74, p. 194. OPERCULUM. Fig. N, 129, p. 196. The central tooth has a wide comparatively shallow base, deeply excavated below.

NIMAL. The external features of the animal are shown in Fig. F.

'YPE LOCALITY. St. 167. Off Signy I., South Orkneys, 60° 50′ 30″ S, 46° 15′ 00″ W, 20 Feb. 1927, -344 m.

St. 162. Off Signy I., South Orkneys, 60° 48′ 00″ S, 46° 08′ 00″ W, 17 Feb. 1927, 320 m.

anidota paucispiralis n.sp., Pl. VIII, figs. 36, 37

hell small, thin and fragile, narrowly ovate, white, covered with a thin buff epidermis. Spire tall the genus, 0·6 height of aperture. Whorls sculptured with a few wide-spaced prominent but narrow, ply raised, spiral ridges, four on penultimate and eleven on the body-whorl. Surface crossed by se, exceedingly fine axial growth lines. Anterior canal deeply notched; fasciole not margined above ridge.

leight 22·1 mm.; diameter 13·5 mm. (holotype).

ENTITION. Fig. L, 77, p. 194. The radula is almost identical with that of *elongata*.

PERCULUM. Typical, horny, ovate, with apical nucleus; very small. Aperture of shell 3·6 times ht of operculum.

Type locality. St. 159. South Georgia, 53° 52′ 30″ S, 36° 08′ 00″ W, 160 m.

St. 157. Off South Georgia, 53° 51′ 00″ S, 36° 11′ 15″ W, 20 Jan. 1927, 970 m.
St. 158. Off South Georgia, 53° 48′ 30″ S, 35° 57′ 00″ W, 21 Jan. 1927, 401–411 m.

?Chlanidota gaini (Lamy)

Sipho gaini Lamy, 1910*b*, p. 319.
Sipho gaini Lamy, 1911*a*, p. 7, pl. 1, figs. 7, 8.
Prosipho? *gaini* Thiele, 1912, p. 262.

Type locality. Off King George I., South Shetlands, 420 m.

This species, known to me only by Lamy's figure of the damaged holotype, seems to be a very narrow, produced-spired *Chlanidota*. The thin shell, style of sculpture, and columellar twist recall *Chlanidota*, also the large size (33 × 12 mm.) suggests this genus rather than *Prosipho*, the members of which are quite small. Hedley (1916) suggested relationship between *Sipho gaini* and his *Pontiothauma ergata*, but that seems unlikely also.

Genus **Pfefferia** Strebel, 1908

Type (here designated): *Pfefferia palliata* Strebel
South Georgia, non *Pfeifferia* Gray, 1853

The genera *Chlanidota* and *Pfefferia*, as already explained, appear to be transitional between the Cominellinae and the Buccinulinae. In *Chlanidota* the shell is very thin, the operculum disproportionately small for the size of the aperture, and the lateral teeth of the radula are tricuspid. In *Pfefferia* the shell is much stouter, the operculum almost fills the aperture, is of peculiar form, with a heavy ridged outer margin, and the lateral teeth of the radula are tricuspid also. In *Cominella* the operculum is relatively large and ovate, with an apical nucleus, but no margining ridge and the lateral teeth of the radula are bicuspid.

The genus *Pfefferia* is known only from deep water off South Georgia.

Pfefferia elata Strebel

Pfefferia elata Strebel, 1908, p. 35, pl. 3, fig. 40.

Type locality. South Georgia, 54° 17′ S, 36° 28′ W, 75 m.

St. 30. West Cumberland Bay, South Georgia, 2·8 miles S 24° W of Jason Lt., 16 Mar. 1926, 251 m.

Height 34·5 mm.; diameter 23·5 mm. (St. 30).
Height 31·0 mm.; diameter 21·0 mm. (St. 30).

Dentition. Fig. L, 78, p. 194. The radula is abnormal in the only specimen, for there are two additional incipient cusps and they are situated one on each side of the normal group of three cusps on the central tooth.

Operculum. Fig. N, 128, p. 196. Typical, horny, leaf-shaped, with apical nucleus and a very massive raised, striated border along the entire outer margin. Aperture of shell 1·3 times height of operculum

Range. South Georgia, 75–251 m.

Pfefferia cingulata Strebel

Pfefferia cingulata Strebel, 1908, pl. 3, figs. 42*a–c*.

Type locality. Cumberland Bay, South Georgia, 252–310 m.

St. 146. Off South Georgia, 53° 48′ 00″ S, 35° 37′ 30″ W, 8 Jan. 1927, 728 m.
St. 158. Off South Georgia, 53° 48′ 30″ S, 35° 57′ 00″ W, 21 Jan. 1927, 401–411 m.

Height 21·3 mm.; diameter 14 mm. (St. 146, young example).

DENTITION. Fig. L, 79, p. 194. The central tooth has three strong equally developed cusps and a eply excavated base. Laterals with a tall slender incurved outer cusp and a shorter truncated, heavy er cusp, plus a small narrow middle cusp situated close alongside the inner cusp.

OPERCULUM. Typical, horny, narrowly ovate, with apical nucleus and thickened margining ridge ng the upper part of the outer edge. In the other species of the genus this margining ridge extends ng the entire outer margin. Aperture 1·6 times height of operculum (Strebel, 1908, pl. 3, fig. 42*b*).

RANGE. South Georgia, 75–728 m.

The following two species complete the known members of the genus.

efferia palliata Strebel

Pfefferia palliata Strebel, 1908, p. 34, pl. 3, fig. 39*a–f*.
Pfefferia palliata Thiele, 1912, pl. 16, fig. 20 (radula).

TYPE LOCALITY. South Georgia, 54° 17′ S, 36° 28′ W, 75 m.

efferia chordata Strebel

1908. *Pfefferia chordata* Strebel, *Schwed. Sudpol. Exped.* VI (1), pl. 3, fig. 41*a–c*.

TYPE LOCALITY. Cumberland Bay, South Georgia, 252–310 m.

Genus Neobuccinum Smith, 1877

Type (monotypy): *Neobuccinum eatoni* Smith

eobuccinum eatoni (Smith)

Buccinopsis eatoni Smith, 1875, p. 68.
Neobuccinum eatoni Smith, 1879, p. 169, pl. 9, figs. 1, 1*a*.
Neobuccinum eatoni Studer, 1879, p. 129.
Neobuccinum eatoni Watson, 1886, p. 216.
Neobuccinum eatoni Smith, 1902, p. 202.
Neobuccinum eatoni Thiele, 1903, p. 168, pl. 9, fig. 57.
Neobuccinum eatoni Lamy, 1906*b*, p. 2.
Neobuccinum eatoni Smith, 1907*a*, p. 1.
Neobuccinum eatoni Melvill & Standen, 1907, p. 139.
Neobuccinum praeclarum Strebel, 1908, p. 31, pl. 3, fig. 38.
Neobuccinum eatoni Lamy, 1910*b*, p. 199.
Neobuccinum eatoni Lamy, 1911*a*, p. 5.
Neobuccinum eatoni Hedley, 1911, p. 6, pl. 1, figs. 11, 12.
Neobuccinum eytoni Thiele, 1912, p. 211.
Neobuccinum eatoni Smith, 1915, p. 72.
Neobuccinum eatoni Lamy, 1915, p. 69.
Neobuccinum eatoni Hedley, 1916, p. 59, pl. 9, fig. 97.
Neobuccinum eatoni Eales, 1923, p. 28.

TYPE LOCALITIES. 3–7 fathoms Royal Sound, Kerguelen I. (*eatoni*); Graham Land, 64° 3′ S, 6° 37′ W, 360 m. (*praeclarum*).

St. 363. 2·5 miles S 80° E of south-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–278 m.
St. 1644. Bay of Whales, 78° 24·8′ S, 164° 10·3′ W, 16 Jan. 1936, 626 m.
St. 1952. Between Penguin I. and Lion's Rump, King George I., South Shetlands, 11 Jan. 1937–383 m.

RANGE. Graham Land (Strebel); South Orkneys (Melvill & Standen); South Shetlands (Lamy); cMurdo Sound and Commonwealth Bay (Hedley); Ross Sea (Smith) and Kerguelen Island (Smith).

Hedley (1916, loc. cit. p. 59) was apparently quite correct in placing *praeclarum* in the synonym of *atoni*. I cannot find any valid points of difference in this variable species.

Dentition. Eales (1923) figured the radula of an example from McMurdo Sound in 20 m. and noted that it showed characters intermediate between *Buccinum* and *Cominella*.

The radula is decidedly more in accord with that of *Cominella* than with that of *Buccinum*, for it has a tricuspid central and although the inner cusp of the laterals is incised to form several weak cusps this tooth is still basically bicuspid. The boreal *Buccinum* on the other hand has six cusps on the centra and four on the laterals. The operculum also conforms more to that of *Cominella* than to that o *Buccinum*. In *Cominella* and *Neobuccinum* the operculum has a terminal nucleus whereas in *Buccinum* it is median submarginal with concentric growth lines.

Genus **Probuccinum** Thiele, 1912

Type (o.d.): *Neobuccinum tenerum* Smith

This is an Antarctic and Subantarctic *Buccinulum*-like group characterized by a thin, semi-transparent shell, ovate operculum with a small paucispiral terminal nucleus, and a radula with both the centra and lateral teeth tricuspid.

The following species were ascribed to the genus by Thiele (1912, loc. cit.): *Neobuccinum tenerum* Smith, 1907, Coulman Island, 100 fathoms; *Probuccinum costatum* Thiele, 1912, Gauss Station, Davis Sea; *Fusus* (*Neptunea*) *regulus* Watson, 1882, Kerguelen I., 28 fathoms; *Fusus* (*Neptunea*) *edwardiensis* Watson, 1882, between Marion I. and Prince Edward I., 140 fathoms; and *Fusu* (*Neptunea*) *scalaris* Watson, 1882, north-west Patagonia, 125 fathoms. The latter, however, seems to b a *Pareuthria*.

Hedley (1916) added a further species in *Probuccinum tenuistriatum* from the D'Urville Sea i 157 fathoms, and Tomlin (1948) recorded *tenerum* from 69 m. off Macquarie I.

Probuccinum delicatulum n.sp., Pl. VII, fig. 28

Shell ovate-fusiform, truncated below, thin, semi-transparent, white, covered with a very thin pal buff epidermis. Whorls six, including a large, smooth, dome-shaped protoconch of 2½ whorls. Post-nuclear sculpture of weak, very numerous, dense spiral striations crossed by crowded, somewha irregular, faint, crisp, axial growth lines. There are about thirty-two spirals on the antepenultimat and about forty-five at the close of the penultimate whorl. The axial growth lines are nowhere strong enough to assume the role of axial ribs, and a casual impression is that the shell is smooth. Spire about one and an eighth times height of aperture. Aperture obliquely D-shaped; outer lip thin, steeply descending from the suture, effuse below the middle and flattened basally, with a broad, very shallow anterior notch. In profile the outer lip is slightly insinuated just below the suture. Columella an parietal wall with an evenly arcuate, narrow, thinly glazed callus. Operculum horny, ovate, wit a small, paucispiral, apical nucleus, Fig. N, 123.

Height 20·5 mm.; diameter 10·5 mm. (holotype).
Height 16·0 mm.; diameter 8·0 mm. (St. 160).

Type locality. St. 140. Stromness Harbour to Larsen Point, South Georgia, from 54° 02′ S 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W, 23 Dec. 1926, 122–136 m.

St. 159. Off South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.
St. 160. Between South Georgia and Shag Rocks, 53° 43′ 40″ S, 40° 57′ W, 7 Feb. 1927, 177 m.

Dentition. Fig. K, 63, p. 193 (holotype). Compared with Thiele's figure of the radula of *tenerum* (Fig. K, 64) the central tooth is proportionately wider, not sinused at the base, and the three cusps ar of equal size, not with the central one stronger.

Operculum. Fig. N, 123, p. 196.

The species is nearest allied to *Probuccinum tenuistriatum* Hedley (1916, p. 58, pl. 8, figs. 95, 96). ompared with the South Georgian species, *tenuistriatum* is proportionately wider and has the addition a varix near the outer lip.

robuccinum angulatum n.sp., Pl. VII, fig. 27

Shell broadly conical with a sharply angled periphery on the last whorl; smooth, except for weak regular axial growth folds; white, covered with a thin, pale buff epidermis. Protoconch conical, erect, 2¾ smooth whorls with a bluntly rounded tip. The holotype has two post-nuclear whorls but is idently not adult. Operculum horny ovate-pyriform, slightly produced on the lower inner edge and ith a terminal nucleus.

TYPE LOCALITY. St. 156. North of South Georgia, 53° 51′ S, 36° 21′ 30″ W, 20 Jan. 1927, 200–236 m.

St. 159. North of South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.

Height 9·9 mm.; diameter 7·0 mm. (holotype).

DENTITION. Fig. K, 65, p. 193. St. 159. Unfortunately, the only example containing the animal has abnormal radula with five cusps on the left lateral and four on the right. The central is of similar ape to that of *delicatulum*, but it also is abnormal in having an additional weak cusp between the ntral cusp and the right-hand outer one.

This species is of heavier build than *delicatulum*, and although the material is not adult the species ill be easily recognized by its strong peripheral angulation.

Genus **Cavineptunea** n.gen.

Type: *Cavineptunea monstrosa* n.sp.

This genus is provided for a *Neptunea*-like shell with a remarkable protoconch, quite unlike any ther I have seen. It is large, like a tall, spirally wound collar, and surrounds a deep apical cavity. The ucleus is small and central, and the spiral collar emerges from it with rapidly increasing whorls. The ffect is definitely neither the result of erosion nor the loss of a prior horny envelope. A juvenile in perfectly non-eroded state has a protoconch of exactly the same form. The operculum is irregularly vate with a blunt terminal nucleus, and the radula consists of a tricuspid central tooth and three or our cusps on the laterals. A similar abnormality is shown in Troschel & Thiele's figure of the radula f *N. bulbacea* (1868, pl. 6, fig. 16) which has three cusps on one lateral and four on the other. Un-ortunately, I was able to prepare only one radula mount, so the normal number of lateral cusps is in loubt.

The shell is tall-spired, with a short, twisted canal and an angulate periphery.

It is difficult to determine whether *Cavineptunea* is an Antarctic relative of the Neptuniidae or simply nother example of the adaptive radiation so marked in the Cominellid-Buccinuloid assemblage of the outhern regions, but the latter supposition is the more likely. Unfortunately, the only available animal vas not well enough preserved to do more than examine the dentition.

avineptunea monstrosa n.sp., Pl. VIII, figs. 38, 39

Shell thin, white, with a film of yellowish buff epidermis. Spire tall, 1⅗ times height of aperture; ase concave, strongly contracted; pillar flexuous. Whorls seven, including a relatively large concave rotoconch of about 2½ whorls, with a tall, straight-sided spiral rim, as described above. The first whorl f the protoconch is smooth, but the second develops closely spaced, weak, flattened spiral cords, and he carinate edge rapidly resolves into one of these spirals as the coiling becomes normal with steep traight-sided whorls. First post-nuclear whorl with ten flattened linear spaced spiral cords, penulti-nate with sixteen, and body whorl, including base, with thirty-eight. Aperture obliquely pyriform;

outer lip thin, straight in profile and obliquely retractive to the axis. Parietal wall deeply excavated. Pillar flexuous and strongly recurved, but the end is broken in the only near adult specimen, so the length of the anterior canal is not known. It cannot be very long, however, judging by the strongly reflexed pillar.

Height 36 mm. (actual), 38 mm. (estimated); diameter 18 mm.

LOCALITIES. St. 159. Off South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m. (holotype).

St. 160. Between South Georgia and Shag Rocks, 53° 43′ 40″ S, 40° 57′ W, 7 Feb. 1927, 177 m. (two juveniles).

DENTITION. Fig. K, 68, p. 193 (St. 159). PROTOCONCH. Fig. N, 105, p. 196.

Subfamily PROSIPHIINAE

Genus **Prosipho** Thiele, 1912

Type (s.d. Thiele 1929): *Prosipho gaussianus* Thiele

Prosipho astrolabiensis (Strebel)

Sipho (?*Mohnia*) *astrolabiensis* Strebel, 1908, p. 31, pl. 3, figs. 37*a–d*.
Prosipho astrolabiensis Thiele, 1912, p. 262.

TYPE LOCALITY. Astrolabe I., 63° 9′ S, 58° 17′ W, 95 m.

St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, 238–270 m.
St. 140. Stromness Harbour to Larsen Point, South Georgia, 23 Dec. 1926, 122–136 m.
St. 144. Off mouth of Stromness Harbour, South Georgia, 5 Jan. 1927, 155–178 m.
St. 190. Bismarck Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 24 Mar. 1927, 93–130 m.
St. WS 27. Off South Georgia, 53° 55′ S, 38° 01′ W, 19 Dec. 1926, 107 m.

RANGE. Palmer Archipelago to South Georgia, 95-279 m. Melvill & Standen's record (1912) of *crassicostatus* from Burdwood Bank, 56 fathoms, requires confirmation.

Melvill & Standen (1912, p. 355) made this species a synonym of their *Chrysodomus* (*Sipho*) *crassicostatus*, described in 1907 (p. 138) from Scotia Bay, South Orkneys, 9–10 fathoms, off weed and stones. Thiele (1912) recognized both as distinct species of *Prosipho*.

I have not seen shallow-water examples comparable with *crassicostatus*, which from Melvill & Standen's figures appears to have coarser spirals and one less on the penultimate and body-whorl than in *astrolabiensis*.

This species and the next, *chordatus* Strebel, are very similar in size, build and sculpture, so much so that they are separable only with difficulty, yet the radulae differ considerably.

Both have a long basal outer extension of the laterals, like a handle, a peculiar feature of *Prosipho* but *astrolabiensis* is bicuspid, whereas in *chordatus* the laterals fan out above and have six cusps. All the *Prosipho* radulae figured by Thiele (1912) have more than two cusps: *similis*, *glacialis*, *pusillus*, *nodosus*, *gaussianus* and *certus*. The central in all the species is narrow and deep based, more or less rectangular and with three cusps.

RADULA. Fig. K, 56, p. 193.

Prosipho chordatus (Strebel)

Sipho? *chordatus* Strebel, 1908, p. 30, pl. 2, fig. 29*a–c*.

TYPE LOCALITY. Cumberland Bay, South Georgia, 252–310 m.

St. 123. Off Cumberland Bay, South Georgia. From 4·1 miles N 54° E of Larsen Point to 1·2 miles S 62 ° W o Merton Rock, 15 Dec. 1926, 230–250 m.
St. 140. Stromness Harbour to Larsen Point, South Georgia, 23 Dec. 1926, 122–136 m.
St. 152. Off South Georgia, 53° 51′ 30″ S, 36° 18′ 30″ W, 17 Jan. 1927, 245 m.
St. 156. Off South Georgia, 53° 51′ S, 36° 21′ 30″ W, 20 Jan. 1927, 200–236 m.

RANGE. South Georgia, 122–310 m.

Although they are of similar size and colour *chordatus* can be always distinguished from *astrolabiensis* by the number of spiral cords which range, as the whorls increase, from two to four in *astrolabiensis* and four to six in *chordatus*. If Melvill & Standen's figures of *crassicostatus* are correct, their species shows the spiral cords increasing from two to three. The cords in *astrolabiensis* are narrower and more sharply raised than in *chordatus*.

RADULA. Fig. K, 55, p. 193.

Prosipho hunteri Hedley

Prosipho hunteri Hedley, 1916, p. 56, pl. 8, fig. 92.

TYPE LOCALITY. Commonwealth Bay, Adelie Land, 25 and 45–50 fathoms.

St. 140. Stromness Harbour to Larsen Point, South Georgia, 23 Dec. 1926, 122–136 m.
St. 152. Off South Georgia, 53° 51′ 30″ S, 36° 18′ 30″ W, 17 Jan. 1927, 245 m.

These 'Discovery' records extend the range of this species to the opposite side of the Antarctic Continent. Although I have not seen actual topotypes, the South Georgia examples compare exactly with Hedley's description and excellent figure.

Height 6·0 mm.; diameter 3·0 mm. (holotype).
Height 6·0 mm.; diameter 3·0 mm. (St. 152).
Height 6·5 mm.; diameter 3·1 mm. (St. 140).

Prosipho cancellatus Smith

Prosipho cancellatus Smith, 1915, p. 71, pl. 1, fig. 13.

TYPE LOCALITY. Ross Sea, 76° 56′ S, 164° 12′ E, 160 fathoms.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan 1936, 351 m.

The shell figured by Smith (loc. cit. pl. 2, fig. 15) from 'off Rio de Janeiro in 40 fathoms' appears to be correctly identified, but the locality is certainly incorrect, as Smith suspected.

Prosipho contrarius Thiele

Prosipho contrarius Thiele, 1912, p. 209, pl. 13, fig. 1.

TYPE LOCALITY. Gauss Station.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

Prosipho perversus n.sp., Pl. VI, fig. 11

This species is very similar to *contrarius*, but it is smaller and has more prominent spiral keels, which ncrease to four instead of three over the last two whorls. Whorls 4½, including a narrowly conic smooth protoconch of 1 whorl, which has an asymmetric nucleus. First and second post-nuclear whorls with three well-developed spiral keels, penultimate with a fourth emergent from the lower suture and body-whorl with four strong, equally developed keels. There are four spiral cords on the neck and these are almost as strong as the keels. In *contrarius* there are seven comparatively weak cords on the neck.

Height 4·0 mm.; diameter 2·0 mm. (*perversus*).
Height 4·6 mm.; diameter 2·3 mm. (holotype of *contrarius*).
Height 5·6 mm.; diameter 2·7 mm. (*contrarius*, St. 1660).

TYPE LOCALITY. St. 144. Off mouth of Stromness Harbour, South Georgia. From 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan 1927, 155–178 m. (one example, the holotype).

Prosipho madigani Hedley

Prosipho madigani Hedley, 1916, p. 56, pl. 8, fig. 93.

TYPE LOCALITY. 25–50 fathoms, Commonwealth Bay, Adelie Land.

St. 182. Schollaert Channel, Palmer Archipelago, 64° 21′ S, 62° 58′ W, 14 Mar. 1927, 278–500 m.

This sole example measures 10·5 × 4·9 mm. and has $5\frac{1}{2}$ whorls, compared with 13·5 × 4·3 mm. an six whorls for Hedley's type. Hedley's measurements are evidently incorrect, however, for the figur shows proportions and sculptural detail in accord with the St. 182 specimen.

The above new record extends the range of the species to the opposite side of the Antarcti Continent. It is of interest also to note that Tomlin (1948, p. 229) has recently recorded the specie from Macquarie Island, which is considerably north of the type locality and just outside the Antarcti convergence.

DENTITION. Fig. K, 54, p. 193. The laterals resemble those of *astrolabiensis*, but the basal plat is more produced and there are three cusps instead of two.

Genus **Anomacme** Strebel, 1905

Type (monotypy): *Anomacme smithi* Strebel

The genotypes of both *Antistreptus* (Dall, 1902*b*, p. 532) and *Anomacme* are superficially very simila apart from the fact that the former is sinistral. The apices are different, however, that of *Anomacm* being decidedly Trophonoid in its asymmetric elongated and almost straight-sided whorls. The radul of *A. smithi*, however (Thiele 1912, pl. 16, fig. 14), is similar to that of *Prosipho*, for the laterals hav the basal plate produced into long narrow process resembling a handle. Unfortunately, the dentitio of *Antistreptus magellanicus* is not known, so for the present it is not advisable to follow Thiele (192 p. 318) in closely associating *Antistreptus* and *Anomacme*.

Anomacme smithi Strebel

Anomacme smithi Strebel, 1905*b*, p. 633, pl. 22, fig. 28*a–e*.
Anomacme smithi Thiele, 1912, pl. 13, fig. 8 and pl. 16, fig. 14:
Antistreptus (*Anomacme*) *smithi* Thiele, 1929, p. 318.

TYPE LOCALITY. Smyth Channel, Strait of Magellan.

St. 388. Between Cape Horn and Staten I., 56° $19\frac{1}{2}$′ S, 67° $09\frac{3}{4}$′ W, 16 Apr. 1930, 121 m. (one empty shell).

DENTITION. Fig. K, 57, p. 193 (after Thiele, 1912).

Strebel's *Glypteuthria contraria* (1908, pl. 1, fig. 4) is a synonym of *Antistreptus magellanicus* Da (1902).

Genus **Meteuthria** Thiele, 1912

Type (o.d.): *Euthria martensi* Strebel

Although *martensi* appears to be a heavily sculptured *Pareuthria*, comparable with *Glypteuthria*, t dentition indicates closer relationship with *Proneptunea*. Both have triangular or fan-shaped lateral the top slope with from four to six cusps and the outer edge with a series of denticles. In *Meteuthr* only the laterals are present, but *Proneptunea* has the addition of a tricuspid central tooth.

Thiele (1929, p. 317) included the Antarctic *Chlanidotella*, *Proneptunea* and *Meteuthria* as subgene of *Thalassoplanes*, a tropical mid-Pacific genus from 2463 fathoms.

The genotype of *Meteuthria* has a conical protoconch of $2\frac{1}{2}$ whorls, the tip smooth, small and pr jecting, followed by a whorl of closely spaced, thin, crisp axials and the remainder reticulated by axia and somewhat stronger spirals. Other members of the genus are Watson's *Fusus* (*Sipho*) *futile* fro between Kerguelen and Heard Islands in 150 fathoms (Watson, 1886) and *Euthria* (*Glypteuthria*) *agnes* Strebel (1905) from Strait of Magellan.

In *Glypteuthria* the protoconch consists of a relatively large, mammillate, smooth, brownish apex f 1½ whorls followed by a brephic reticulated stage.

leteuthria martensi (Strebel)

Euthria (*Glypteuthria*) *martensi* Strebel, 1905*b*, p. 630, pl. 21, fig. 13*a*, *b*.
Meteuthria martensi Thiele, 1912, p. 243, pl. 13, fig. 7 and pl. 16, fig. 18.

Type locality. Smyth Channel, 10 fathoms, Strait of Magellan.

St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m. (empty shells only).

Dentition. Fig. K, 62, p. 193 (after Thiele, 1912).

Genus **Proneptunea** Thiele, 1912

Type (o.d.): *Fusus* (*Troschelia*?) sp. Martens & Thiele, 1903 = *Proneptunea amabilis* Thiele, 1912

The shells of this genus are small, fusiform, with a thick brownish epidermis and are sculptured vith prominent spiral keels. The protoconch is relatively large, paucispiral with straight sides, slightly oncave on top and with an inrolled nucleus. The operculum is horny, irregularly ovate-quadrate, with . terminal nucleus. The radula consists of a deep and narrow-based tricuspid central and quadrate aterals with five well-formed cusps on the upper edge and a series of small denticles down the outer nargin.

Martens and Thiele's *Fusus* (*Troschelia*?) sp. and Thiele's *Proneptunea amabilis*, both from Kerguelen sland and acknowledged to be identical by Thiele (1912), have this same style of dentition.

roneptunea fenestrata n.sp., Pl. VI, fig. 12

Shell small, fusiform, with a thick yellowish brown epidermis, prominently sculptured with heavy piral keels and interstitial thin axial lamellae. Whorls five including a relatively large paucispiral erect rotoconch of 1½ straight-sided whorls inrolled at the tip, leaving an apical depression. Spire slightly aller than height of aperture plus canal. Spire whorls bearing two very prominent keels, the uppernost, which defines a broad, almost flat shoulder, becoming bifid at the commencement of the penultinate whorl. Body-whorl with the addition of a third prominent keel at the top of the aperture and hree much weaker spirals on the base. The shoulder, the interspaces and base crossed by regular risp axial epidermal lamellae, twenty-one on the penultimate and twenty-nine on the body-whorl. perture approximately ovate-pyriform, deeply grooved on the inside, corresponding to the external eels. Outer lip deeply scalloped between the keels, but bridged by the lamellae. Anterior canal short, blique, and spirally twisted, causing a prominent fasciole which is crossed transversely by a conentration of the terminals of the lamellate processes. In some examples the bifid peripheral keel hows the lamellae in the interspace, but on the crest of the keels the lamellae are scarcely apparent. perculum irregularly ovate-quadrate, with a terminal nucleus.

Height 12·0 mm.; diameter 6·6 mm. (holotype, St. 141).

Type locality. St. 141. East Cumberland Bay, 200 yards from shore, under Mt Duse, South eorgia, 29 Dec. 1926, 17–27 m.

St. 140. Stromness Harbour to Larsen Point, South Georgia, from 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W, 23 Dec. 1926, 122–136 m.
St. 145. Stromness Harbour, between Grass I. and Tonsberg Point, South Georgia, 7 Jan. 1927, 26–35 m.
St. WS 25. Undine Harbour (north), South Georgia, 17 Dec. 1926, 18–27 m.
St. MS 10. East Cumberland Bay, ¼ mile south-east of Hope Point to ¼ mile south of Government Flagstaff, South Georgia, 14 Feb. 1926, 26–18 m.

Dentition. Fig. K, 67, p. 193 (St. 141). Protoconch and Operculum. Fig. N, 106, 124, p. 196.

Proneptunea duplicarinata n.sp., Pl. VI, fig. 13

Shell small, fusiform, thin, covered with a pale yellowish brown epidermis, prominently sculpture with heavy spiral keels, the main ones divided into two or three by linear grooves, and crossed b distant fringe-like axial epidermal processes. Whorls five, including a relatively large, smooth, paucispiral protoconch of two straight-sided whorls, the top concave, oblique, with a slightly inrolled nucleus Spire slightly less than height of aperture plus canal. First post-nuclear whorl sculptured with thre prominent spiral keels, the uppermost, at about three-fourths whorl height, defining a broad, slightl concave shoulder. Second post-nuclear whorl with both the uppermost and lowest keels bifid an penultimate with the uppermost and lowest trifid and the middle one bifid. Body-whorl with the sam development as the penultimate plus another bifid keel, level with the top of the aperture, six simple widely spaced spirals on the base and neck, and six closely spaced, weak spiral cords on the fasciole Axials in the form of fringe-like epidermal lamellate processes, eleven per whorl. The lamellae ar regularly deeply scored, causing them to split into a series of moderately long, narrow tags. Apertur broadly ovate but produced below into a relatively long, obliquely recurved anterior canal. Outer li thin, corrugated by the external sculpture and deeply spirally scored within.

Height 17·0 mm.; diameter 7·0 mm.

TYPE LOCALITY. St. 160. Between South Georgia and Shag Rocks, 53° 43′ 40″ S, 40° 57′ W 7 Feb. 1927, 177 m.

DENTITION. Fig. K, 66, p. 193.

Genus **Chlanidotella** Thiele, 1929

Type (monotypy): *Cominella modesta* Martens

Chlanidotella modesta (Martens)

Cominella modesta Martens, 1885, p. 91.
Cominella modesta Martens & Pfeffer, 1886, p. 73, pl. 1, fig. 4*a–e*.
Chlanidota modesta Strebel, 1908, p. 33.
Thalassoplanes (*Chlanidotella*) *modesta* Thiele, 1929, p. 317.
Chlanidota (*Chlanidotella*) *modesta* David, 1934, 2–3, p. 128.

TYPE LOCALITY. South Georgia.

St. WS 56. Larsen Harbour, Drygalski Fjord, South Georgia, 14 Jan. 1927, 2 m.
St. MS 10. East Cumberland Bay, $\frac{1}{4}$ mile south-east of Hope Point to $\frac{1}{4}$ mile south of Government Flagstaf 14 Feb. 1925, BTS, 26–18 m.

RANGE. South Georgia, 0–18 m.

DENTITION. Fig. L, 80, p. 194. The laterals bear four cusps, evidently the result of regular bifurcatio of an original two. The central tooth has the usual three cusps of the family, but the basal plate is deepe than in either *Chlanidota* or *Pfefferia*. The operculum has a terminal nucleus.

Family MURICIDAE

The dentition of the southern Trophons does not present any clear-cut types. In fact, the radulae o both the Muricidae and the Thaisidae conform remarkably to a single type which presents only mino variations. The protoconch, however, clearly divides the southern Trophons into two main groups (1) with a paucispiral asymmetrical nucleus and (2) with a polygyrate conical nucleus.

The Trophons are members of the Muricidae because they have an operculum with a terminal o subterminal nucleus and a rounded, not flattened or excavated columella. The members of the Thaisidae on the other hand, have an operculum with a lateral nucleus and the columella is definitely flattened t excavated. Muricids are mostly lightly built with lamellate to spinose sculpture and a long anterio canal. Thaisids, on the other hand, are usually solid, ovate, with rugged sculpture and relatively shor anterior canal.

That the Muricids and Thaisids are more closely interrelated than is generally supposed would seem be indicated by the dentition. On shell and opercular characters there is little to distinguish the outh Georgian *Trophon shackletoni paucilamellatus* from the Magellanic *T. laciniatus*, but whereas the rmer has a radula typical of most Trophons that of the latter closely agrees with the rather distinctive pe found in the Thaisid genus *Stramonita* and also in certain of the *Drupa*-like genera. The similarity ould appear to be too strong to be accounted for by mere coincidence. This type of radula differs from at of the remaining members of the family in having well-developed denticles along the outer edge of e side cusps of the central tooth.

I am not suggesting that on the one-sided evidence of the radula only one family should be admitted, r it seems that the characters of both the operculum and the columella afford a satisfactory differentiaon that is in accord with general shell characters.

It is yet to be satisfactorily explained to what extent the radula can become modified to suit different eding methods. In cases where a shellfish, presumed to have been an active feeder, has developed ciliary method, the response appears to be a reduction of the radula to vestigial and functionless size ather than a radical change in the form and arrangement of the teeth. This has apparently occurred in *rophon echinolamellatus* (described below), a shell of equal size to that of the genotype, *Trophon eversianus*, but with a radula that is many times smaller than that of the second named species.

Genus **Trophon** Montfort, 1810

Type (o.d.): *Trophon magellanicus* Gmelin (=*geversianus* Pallas)

The genus *Trophon* is well developed in the southern ocean and has its counterpart in *Boreotrophon* f Arctic and North Temperate seas. Typical *Trophon* has a large globose thin shell with prominent xial lamellae and a smooth paucispiral asymmetrical protoconch. The radula consists of a central tooth ith an L-shaped lateral on each side. The central tooth is broad and shallow with three main cusps nd two intermediates. Operculum horny, ovate with a terminal nucleus.

rophon geversianus (Pallas)

Buccinum geversianus Pallas, 1769, p. 33, pl. 3, fig. 1.
Murex magellanicus Gmelin, 1792, p. 3548, no. 80 (excl. var. B).
Murex magellanicus Dillwyn, 1817, p. 725.
Murex lamellosus Dillwyn, 1817, p. 730.
Murex magellanicus Wood, 1818, p. 132, pl. 26, fig. 90.
Murex patagonicus, magellanicus and *varians* d'Orbigny, 1841, pp. 451–4.
Trophon geversianus Gould, 1852, p. 227, pl. 6, fig. 227.
Fusus geversianus (Gay) Hupé, 1854, p. 167.
Trophon geversianus Tryon, 1880, p. 144, pl. 32, figs. 337–340.
Trophon geversianus Rochebrune & Mabille, 1889, p. H 53.
Trophon geversianus Strebel, 1905*a*, p. 173, pls. 4–6.
Trophon geversianus Smith, 1905, p. 334.
Trophon geversianus Melvill & Standen, 1907, p. 106.
Trophon geversianus Strebel, 1908, p. 37, pl. 6, fig. 94*a, b*.
Trophon geversianus Melvill & Standen, 1914, p. 120.

TYPE LOCALITY. Strait of Magellan.

St. 56. Sparrow Cove, Port William, East Falkland Is., 1½ cables N 50° E of Sparrow Point, 16 May 1926, 10½–16 m.
St. 58. Port Stanley, East Falkland Is., 19 May 1926, 1–2 m.
St. 1230. 6·7 miles N 62° W from Dungeness Lt., Magellan Strait, 23 Dec. 1933, 27 m.
St. WS 847. Off Santa Cruz, Patagonia, 50° 18′ 45″ S, 67° 44′ W, 9 Dec. 1932, 56–84 m.

Range. Southern Chile and Argentina, Strait of Magellan, Tierra del Fuego and Falkland Is. 0–100 m. Recorded also by Melvill & Standen (1907, loc. cit.) from Scotia Bay, South Orkneys, 9–1 fathoms, but this record probably refers to the new species *echinolamellatus* described following.

Dentition. Fig. L, 81, p. 194. The central tooth has three massive cusps, the middle one tallest two very weak intermediates which appear as offshoots from the inner faces of the outer cusps an upturned projections at the extremities of the basal plate which may serve as cusps also. Protoconch Fig. N, 107, p. 196.

Trophon philippianus Dunker

Fusus intermedius (Gay) Hupé, 1854, p. 166, pl. 4, fig. 6 (non *Fusus intermedius* Cristofori & Jan., 1832 o Michelotti, 1846).
Trophon philippianus Dunker, 1878, p. 277, pl. 72, figs 4, 5.
Fusus intermedius Tryon, 1880, pl. 70, fig. 433 (reproduction of Gay's pl. 4, fig. 6).
Trophon intermedius Rochebrune & Mabille, 1889, 53.
Trophon geversianus philippianus Strebel, 1904*a*, p. 174, pl. 8, fig. 81*a–d*.
Trophon philippianus Melvill & Standen, 1907, p. 107.
Trophon philippianus Melvill & Standen, 1912, p. 354.

Type locality. Strait of Magellan.

St. WS 834. Off Strait of Magellan, 52° 57′ 45″ S, 68° 08′ 15″ W, 2 Feb. 1932, 27–38 m.

Range. Strait of Magellan; Falkland Is.; Burdwood Bank, South of Falkland Is., 56 fathoms (Melvil & Standen, 1912, loc. cit.).

This species lacks the lamellate axials of *geversianus*, but more material than I have at hand may sho that Strebel was correct in considering *philippianus* as merely a subspecies of *geversianus*. Both form are present in a small series of littoral shells I have from Port Stanley, Falkland Islands.

Trophon echinolamellatus n.sp., Pl. IX, figs. 44, 45

Shell large, fusiform, strongly sculptured with sharply raised spiral cords crossed by closely space lamellae produced into hollow recurved spines at the points of intersection. Whorls six including th last whorl of a small protoconch, much eroded in only available material. Spire tall, 0·83 of height o aperture plus canal. Sculptured with fairly prominent flat-topped spiral cords with interspaces mostl of about the same width as the cords. They number four on the first and second post-nuclear whorls six on the penultimate and twelve on the body-whorl and base, those on the base having somewha wider interspaces. All the post-nuclear whorls are crossed by numerous thin lamellae which ar developed into sharp recurved hollow spines wherever they cross the spiral cords. There are abou twenty-two axial lamellae on the penultimate and about twenty on the body-whorl, but they ar irregularly disposed. In addition, the surface is scored by weak spiral striations, even on the cords but not on the actual spines. Aperture ovate, produced below into a short obliquely recurved anterio canal. Fasciole as a high, narrow, spiral ridge imbricated with numerous hollow spines. Outer li dilated into a polished recurved rim which is crenulated and scalloped along its outer edge by th effect of the surface sculpture. Inner lip, a moderately wide smooth callus with a well-marked, almos free edge. Colour cinnamon-buff to orange-cinnamon with traces of a spirally zoned pattern i slightly darker or more reddish brown; upper zone occupying most of the upper portion of the body whorl, middle zone much narrower and lowest zone on the fasciole.

Height 63 mm.; diameter 35 mm. (holotype).

Height 64 mm.; diameter 39 mm. (paratype).

Type locality. St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927 342 m.

This species stands nearest to *geversianus*, from which it differs in being more elongate and in having lamellae produced into hollow spines. Also the surface spiral striations are not present in *geversianus*, ich is white with the interior of the aperture often diffused with brown.

ENTITION. Fig. L, 83, p. 194. The central tooth has a broad, shallow, arched, basal plate, bearing three ge triangular cusps, middle one tallest, and two very weak intermediate denticles which are situated the troughs, not offshoots from the outer cusps as in *geversianus*.

phon scotianus n.sp., Pl. IX, figs. 48, 49

hell rather large, thin, light buff; sculptured with elevated, coronated, thin lamellae and a surface tern of low, rounded, spiral cords. Post-nuclear whorls five, plus a minute, smooth, papillate toconch of 1½ whorls, the apex oblique and inrolled. Spire 0·6 height of aperture plus canal. Axial lpture of very prominent, thin lamellae, produced into erect coronated processes on the shoulder l extending over base to neck of canal, which is rendered prominently scaly by successive terminals abial varices. Axials six per whorl. Spiral sculpture of rather broad, low, rounded, spiral cords with arrow thread in each interspace. Labial varix broad, expanded and recurved, evenly arcuate right he shallowly sinused termination of the anterior canal. Operculum irregularly ovate, with terminal leus.

eight 34 mm.; diameter 24 mm. (holotype).

YPE LOCALITY. St. WS 27. Off South Georgia, 53° 55′ 00″ S, 38° 01′ 00″ W, 19 Dec. 1926, 107 m. lotype, sole example).

ENTITION. Fig. M, 88, p. 195. The central tooth resembles that of *echinolamellatus* in having an hed base and three triangular main cusps, but the intermediates are better developed.

he species differs from *shackletoni paucilamellatus* in having fewer axial lamellae, well-developed al sculpture, the labial varix extending to the end of the anterior canal, and in being coloured.

phon shackletoni paucilamellatus n.subsp., Pl. IX, fig. 52

hell moderately large and thin, white, with a short spire, long canal and prominent sculpture in the n of a few wide, recurved, thin, smooth lamellae which rise high above the whorls and coronate the e. Whorls five, including a small, smooth protoconch. Axial lamellae twelve on the first postlear whorl, but reduced to eight on both the penultimate and the body-whorl. The lamellae vary ween seven and ten on the last two whorls in examples from other South Georgian stations. Surface hell smooth. Spire half the height of the aperture plus canal. Canal long, slightly reflexed and rved.

eight 31 mm.; diameter 21 mm. (holotype, St. 148).

YPE LOCALITY. St. 148. Off Cape Saunders, South Georgia, from 54° 03′ S, 36° 39′ W to 54° 05′ S, 36′ 30″ W, 9 Jan. 1927, 132–148 m.

St. 27. West Cumberland Bay, South Georgia, 3·3 miles S 44° E of Jason Lt., 15 Mar. 1926, 100 m.

St. 140. Stromness Harbour to Larsen Point, South Georgia, from 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W, 23 Dec. 1926, 122–136 m.

St. 144. Off Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m.

St. 159. Off South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.

St. 363. 2·5 miles S 80° E of south-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–278 m.

St. WS 33. Off South Georgia, 54° 59′ S, 35° 24′ W, 21 Dec. 1926, 130 m.

he species *shackletoni* Hedley (1911) is found from seven to twenty fathoms off Cape Royds, in Ross Sea on the opposite side of the Antarctic Continent.

From *shackletoni* the South Georgian subspecies differs in having fewer and more prominent axial lamellae. In Cape Royds and South Georgian shells of adult size the lamellae number from twelve to fourteen in the former and from seven to ten in the latter. Hedley's series consisted of ten examples and mine of five adults and six juveniles, so the differences noted appear constant enough to warrant separating the South Georgian shells as a new regional subspecies.

DENTITION. Fig. L, 82, p. 194 (St. 144). The central tooth is very broad and shallow, slightly arched and bears three long slender main cusps and two intermediates which lie close to the outer cusps.

Trophon brevispira von Martens

Trophon brevispira Martens, 1885, p. 91.
Trophon brevispira Martens & Pfeffer, 1886, p. 68, pl. 1, figs. 1*a*, *b*.
Trophon brevispira Strebel, 1908, p. 42, pl. 4, fig. 48*a–c*.
Trophon brevispira L. David, 1934, 2–3, p. 128.

TYPE LOCALITY. South Georgia.

St. WS 25. Undine Harbour (north), South Georgia, 17 Dec. 1926, 18–27 m.
St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, 238–270 m.

Only worn empty shells from both stations and evidently washed down from shallow water.

Trophon distantelamellatus Strebel

Trophon distantelamellatus Strebel, 1908, p. 43.

TYPE LOCALITY. South Georgia, 54° 23′ S, 36° 26′ W, 64–74 m.

This species bears close resemblance to young, non-eroded examples of *albolabratus*, but differs constantly in its narrower proportions and regularly crenulated axials.

St. MS 10. East Cumberland Bay, $\frac{1}{4}$ mile south-east of Hope Point to $\frac{1}{4}$ mile south of Government Flagstaff South Georgia, 14 Feb. 1925, 26–18 m.
St. MS 67. East Cumberland Bay, 3 cables north-east of Hobart Rock to $\frac{1}{2}$ cable west of Hope Point, South Georgia, 28 Feb. 1925, 38 m.
St. MS 71. East Cumberland Bay, 9$\frac{1}{4}$ cables E × S to 1·2 m. E × S of Sappho Point, South Georgia, 9 Mar. 1926 110–60 m.

DENTITION. Fig. M, 87, p. 195.

Height 40·0 mm.; diameter 18·0 mm. (holotype, *albolabratus*).
Height 24·5 mm.; diameter 16·0 mm. (holotype, *cinguliferus*).
Height 15·1 mm.; diameter 7·9 mm. (holotype, *distantelamellatus*).
Height 15·0 mm.; diameter 7·8 mm. (St. MS 67, *distantelamellatus*).
Height 19·0 mm.; diameter 9·2 mm. (St. MS 10, *distantelamellatus*).

Trophon ohlini Strebel

Trophon ohlini Strebel, 1905*a*, p. 203, pl. 3, fig. 9*a–e*.

TYPE LOCALITY. Puerto Harris, 15 fathoms, Patagonia.

St. WS 80. Between Falkland Is. and Patagonia, 50° 58′ S, 63° 39′ W to 50° 55′ 30″ S, 63° 36′ W, 3 Feb. 1927 152–156 m.
St. WS 216. North of Falkland Is. and east of Cape Blanco, Patagonia, 47° 37′ S, 60° 50′ W, 1 June 1928 219–133 m.
St. WS 225. Between Falkland Is. and Patagonia, 50° 20′ S, 62° 30′ W, 9 June 1928, 162–161 m.
St. WS 243. Between Falkland Is. and Point Santa Cruz, Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m

DENTITION. Fig. L, 84, p. 194. The basal plate of the central tooth is broad and shallow, slightly arched, and bears three tall narrowly triangular main cusps of equal size and two well-developed intermediates, two-thirds the height of the main cusps.

The protoconch is paucispiral, asymmetrical, with almost straight-sided whorls, the top flattened, lted, and slightly inrolled. The present material has the spiral sculpture slightly stronger than shown Strebel's figure.

rophon minutus (Strebel ms.) Melvill & Standen

Trophon minutus (Strebel ms.) Melvill & Standen, 1907, p. 107, pl. 1, figs. 7, 7*a*.
Trophon minutus Strebel, 1908, p. 44, pl. 4, fig. 47*a*, *b*.
Trophon minutus Melvill & Standen, 1912, p. 354.

TYPE LOCALITIES. Scotia Bay, South Orkneys, 9–15 fathoms (Melvill & Standen); South Georgia, 4–52 m. (Strebel).

St. 190. Bismark Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 93–130 m. (one example).

rophon poirieria n.sp., Pl. IX, fig. 51

Shell small, thin, white, angulate-fusiform, tall spired, sculptured with distant upwardly produced ollow spines. Whorls 6, including the usual asymmetrical paucispiral smooth protoconch of 1½ whorls. pire taller than height of aperture plus canal. Whorls angled just above the middle and sculptured with pwardly inclined and recurved hollow peripheral spines, seven on the penultimate and 10 on the body-horl. Surface smooth except for axial growth lines connected with the peripheral spines. Aperture roadly ovate but produced below into a relatively long, narrow, oblique and recurved anterior canal.

Height 15·5 mm.; diameter 8·75 mm. (holotype, St. 190).

TYPE LOCALITY. St. 190. Bismark Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 24 Aug. 1927, 3–130 m.

St. 170. Off Cape Bowles, Clarence I., South Shetlands, 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m.

The species is so named on account of its resemblance to the New Zealand genus *Poirieria*. It is pparently nearest allied to *Trophon coulmanensis* Smith, 1907, but lacks both the longitudinal develop-ent of the axial lamellae and the surface striations of that species.

rophon declinans Watson

Trophon declinans Watson, 1882, p. 388.
Trophon declinans Watson, 1886, p. 168, pl. 10, fig. 10.

TYPE LOCALITY. Off Marion I., 46° 48′ S, 37° 49′ 30″ E, 69 fathoms.

St. 1563. Off Marion I., 46° 48·4′ S, 37° 49·2′ E, 7 Apr. 1935, 113–99 m.
St. WS 228. North-east of Falkland Is., 50° 50′ S, 56° 58′ W, 30 June 1928, 229–236 m.

Tomlin (1948, p. 228) recently recorded *declinans* from 69 m. off Macquarie Island, but this material ow before me is of an angulate species with the addition of spiral sculpture. It closely resembles *elseneeri* Smith, 1915.

rophon cuspidarioides n.sp., Pl. IX, fig. 50

Shell small, fusiform, with a rather short spire but a disproportionately long, flexed and recurved nterior canal. Whorls about 5½, including the protoconch, which is damaged in both examples, but vidently paucispiral. Spire 0·4 time height of aperture plus canal, slightly shouldered at two-thirds horl height. Sculpture defaced on spire whorls but on the body-whorl there are five ill-defined, blunt piral cords, first at the shoulder angle, second between the shoulder and the lower suture, third level ith the top of the aperture, fourth and fifth on the base, the fifth almost obsolete. Axials irregular, ostly weak and fold-like, about twenty-five on the body-whorl. Actual aperture ovate but produced elow into a very long flexed and recurved anterior canal, very little tapered and with a blunt termination. From the back, the canal bears a striking resemblance to the rostrum of the bivalve *Cuspidaria* Colour dull white. Operculum normal, ovate-pyriform with a terminal nucleus.

Height 13 mm.; diameter 5·7 mm. (holotype, St. 42).

Type locality. St. 42. Off mouth of Cumberland Bay, South Georgia, 1 Apr. 1926, 120–204 m

St. 144. Off mouth of Stromness Harbour, South Georgia, 5 Jan. 1927, 155–178 m.

This species belongs to a southern group comprising *Trophon scolopax* Watson from betweer Kerguelen and Heard Islands, 150 fathoms, *Trophon septus* Watson, Royal Sound, 28 fathoms Kerguelen Island and *Trophon acanthodes* Watson from West Patagonia in 175–245 fathoms (al figured by Watson, 1886, pl. 10).

The dentition, operculum and protoconch, so far as can be judged by the available material, show no marked departure from those of typical *Trophon*. The abnormally long anterior canal is scarcely o sufficient taxonomic importance to warrant even subgeneric separation of this group of species.

Dentition. Fig. M, 89, p. 195 (St. 42).

Subgenus **Stramonitrophon** n.subg.

Type: *Trophon laciniatus* Martyn

This new subgenus is proposed solely on account of the dentition, which is quite unlike that of other Trophons but bears a remarkable resemblance to the radula of the Thaisid genus *Stramonita* (see Troschel, 1869, pl. 12, figs. 3–9). The central tooth has a broad, shallow, rectangular base with upturned denticulate ends and three very large and tall main cusps. The middle one is slender and tallest and the side ones broad, rendered bifid by a semi-detached cusp on the inner slope and bearing four denticles on the outer slope.

The protoconch is paucispiral as in typical *Trophon*, the operculum ovate with a terminal nucleus and the shell is fusiform with prominent lamellate axials.

Apart from the anomalous dentition, there is nothing to distinguish *laciniatus* from a normal *Trophon*

Trophon (Stramonitrophon) laciniatus (Martyn)

Buccinum laciniatum Martyn, 1789, pl. 42.
Fusus laciniatus (Gay) Hupé, 1854, p. 168.
Trophon laciniatus Rochebrune & Mabille, 1889, p. 53.
Trophon laciniatus Strebel, 1905*a*, pl. 3, figs. 1–8.
Trophon laciniatus Strebel, 1908, p. 37.

Type locality. Strait of Magellan.

St. WS 85. 8 miles S 66° E of Lively I., East Falkland Is. 25 Mar. 1927, 79 m.
St. WS 788. Between Falkland Is. and Patagonia, 45° 07′ S, 65° W to 45° 07′ S, 64° 54′ W, 13 Dec. 1931, 82–88 m

Range. Strebel (1904, loc. cit) records this species from many Magellan localities; Falkland Is. 25 m.; Burdwood Bank, 137–150 m. and South Georgia, 75 m.

The South Georgia record, however, is probably based upon *shackletoni paucilamellatus* n.subsp

I am not certain if the 'Discovery' material is correctly placed in *laciniatus*, but certainly the St. WS 8 shell closely resembles Strebel's (1904) fig. 1, pl. 3, and the St. WS 788 shell his fig. 7, pl. 3.

Dentition. Fig. L, 86, p. 194 (St. WS 788). The radula of a St. WS 85 specimen is identical.

Subgenus **Fuegotrophon** n.subg.

Type: *Fusus crispus* Gould, 1849

This new subgenus is provided for a small group of Magellan Trophons of fusiform shape with urreted spire and long canal, and sculptured with spiral cords crossed by bluntly rounded axials and dense surface covering of low crisp lamellate ridges. Its distinctive features are a paucispiral, asymetrical, rather bulbous, smooth protoconch and a dentition that departs somewhat from the stereotyped onotony of most Trophonoid radulae. These differences are exhibited in the central tooth, which as the massive central cusp reinforced by a buttress which extends below the lower margin of the basal late. The basal plate is broad, shallow and rectangular, but with three basal projections caused by downward extension of the outer basal extremities, plus the base of the central buttress. The upper nd outer extremities of this plate are upwardly produced to form two extra cusps, giving a formula of even cusps instead of the usual five. The three primary cusps are well developed with the central one rgest; the intermediates are very little less in size than the outer primary cusps and of approximately qual size to the extra cusps on the outer extremities of the basal plate. The transverse ridge representing e upper edge of the central tooth bears groups of several parallel vertical grooves, or incipient denticles, t each outer extremity.

The operculum is ovate-quadrate with a blunt terminal nucleus situated at the lower right-hand orner.

rophon (Fuegotrophon) pallidus (Broderip)

Murex pallidus Broderip, 1832, p. 194.
Fusus crispus Gould, 1849, p. 141 (non *Fusus crispus* Borson, 1821 (1822?)).
Fusus fimbriatus (Gay) Hupé, 1854, p. 165, pl. 4, fig. 7 (non *Fusus fimbriatus* Borson, 1821 (1822?)).
Fusus fasciculatus Hombron & Jacquinot, 1854, p. 110, pl. 25, figs. 15, 16.
Trophon crispus Tryon, 1880, II, p. 143, pl. 31, figs. 328, 329, pl. 70, fig. 437.
Trophon crispus Strebel, 1905*a*, p. 204, pl. 3, fig. 10 *a–g*.
Trophon crispus Melvill & Standen, 1907, p. 106.
Trophon crispus burdwoodianum Strebel, 1908, p. 38, pl. 1, fig. 15*a–c*.

Type localities. Falkland Is. (*pallidus*); Strait of Magellan (*crispus*, *fimbriatus* and *fasciculatus*); urdwood Bank, 137–150 m. (*burdwoodianum*).

St. 51. Off Eddystone Rock, East Falkland I., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 105–115 m.
St. 56. Sparrow Cove, Port William, East Falkland Is., 1½ cables N 50° E of Sparrow Point, 16 May 1926, 10½–16 m.
St. 57. Port William, East Falkland Is., 5½ cables S 20° W of Sparrow Point, 16 May 1926, 15 m.
St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m.
St. WS 85. 8 miles S 66° E of Lively I., East Falkland Is., 25 Mar. 1927, 79 m.
St. WS 88. North of Staten I. from 54° S, 65° W to 54° S, 64° 55′ W, 6 Apr. 1927, 118–118 m.
St. WS 750. Off entrance to Strait of Magellan, 19 Sept. 1931, 95 m.
St. WS 824. Off Falkland Is., 52° 29′ S, 58° 27′ W, 19 Jan. 1932, 146–137 m.

I have selected *pallidus* as the earliest name for the well-known but preoccupied *crispus* since the type ocality Falkland Islands and Sowerby's figure seem to indicate this species, but if my interpretation hould prove to be incorrect, then *fasciculatus* Hombron & Jacquinot must be used. Cossmann's ubstitute name *Trophon gouldi* (1903, p. 54) was bestowed upon a New Zealand Pliocene fossil, rongly ascribed to *crispus*.

The small sculptural differences upon which Strebel based his *burdwoodianum* are covered by th normal range of variation within the species. The *burdwoodianum* type of sculpture (widely space spirals) is mostly found in the deep-water stations, but the fact that both forms occur at the shallow water (10½–16 m) St. 56 precludes the interpretation of *burdwoodianum* as a benthic subspecies.

Dall (1902*b*, p. 535) described an apparently closely related species, *T. pelecetus*, which is based upo Gould's *Fusus crispus* var. (1852, p. 229, pl. 16, fig. 279*b*).

DENTITION. Fig. L, 85, p. 194 (St. 56). PROTOCONCH. Fig. N, 111, p. 196.

Genus Xymenopsis n.g.

Type: *Fusus liratus* Gould

This genus is provided for a large group of Magellan species which differ from typical *Trophon* i having a tall, narrowly conic, polygyrate protoconch instead of a paucispiral asymmetrical one, an sculpture in the form of rounded axial varices crossed by spiral cords, but never lamellate processes

The style of protoconch is similar to that of the New Zealand genus *Zeatrophon* and the sculpture t that of *Xymene*, another New Zealand genus.

The central tooth of the radula is distinctive in that the base is a simple, broad, shallow, almos straight bar with rounded ends and the cusps, consisting of three tall, slender primaries and tw intermediates appear as serrations of a single outgrowth from the basal plate.

There is a large number of nominal species in this group, but doubtless many of them ultimately wi prove to be synonyms. The following names refer to members of the genus *Xymenopsis: acuminatu* Strebel, 1904; *albidus* Philippi, 1846; *albus* and *brucei* Strebel, 1904; *cancellarioides* Reeve, 184 (=*liratus* Gould); *cancellinus* Philippi, 1845; *candidatus* Rochebrune & Mabille, 1889; *corrugatus* Reev 1848; *couthouyi* Strebel, 1904; *decolor* Philippi, 1845; *dispar* Rochebrune & Mabille, 1889; *elegan* and *elongatus* Strebel, 1904; *falklandicus* Strebel, 1908; *fenestratus* and *hoylei* Strebel, 1904; *lebrun* Rochebrune & Mabille, 1889; *liratus* Gould, 1849; *loebbeckei* Rochebrune & Mabille, 1889; *obesus* *ornatus*, *paessleri* and *paessleri turrita* Strebel, 1904; *plumbeus* Gould, 1852; *pseudoelongatus* and *ringe* Strebel, 1904; *roseus* Hombron & Jacquinot, 1853 (=*plumbeus*?); *standeni* Strebel, 1904; *textiliosu* Hombron & Jacquinot, 1854 (=*liratus* Gould); and *violaceus* Rochebrune & Mabille, 1889.

An evaluation of these names is not possible without recourse to the type material which is i European museums.

Xymenopsis liratus (Gould)

Buccinum cancellarioides Reeve, ?1847 (Feb.) (non *Buccinum cancellaroides* Bast. in Grateloup '1840–1846' stated by Sherborn to be 1847).
Fusus liratus (Couthouy ms.) Gould, 1849, p. 141 (non *Fusus lyratus* Deshayes, 1843).
Fusus textiliosus Hombron & Jacquinot, 1854, pl. 25, figs. 9, 10 (non Deshayes, 1835).
Trophon liratus Strebel, 1905*a*, p. 238, pl. 8, fig. 74*a–c*.
Trophon liratus Melvill & Standen, 1907, p. 107.
Trophon liratus Strebel, 1908, p. 37.
Trophon liratus Melvill & Standen, 1914, p. 120.

TYPE LOCALITY. Patagonia (*liratus*).

St. 52. Port William, East Falkland Is., 7·4 cables N 17° E of Navy Point, 5 May 1926, 17 m.
St. 1230. 6·7 miles N 62° W from Dungeness Lt., Magellan Strait, 23 Dec. 1933, 27 m.
St. WS 784. North of Falkland Is., 49° 47′ 45″ S, 61° 05′ W, 5 Dec. 1931, 170 m.

It seems probable that Reeve's *Buccinum cancellarioides* from unknown locality is identical wit Gould's *Fusus liratus*, but I hesitate to upset a well-known name, expecially since the actual date of th nflicting *Buccinum cancellaroides* Bast. is in doubt. Deshayes's *Fusus lyratus* does not affect Gould's . *liratus*, since the derivations are different.

I have placed in *liratus* all the shells with the axials cut by linear spiral grooves. These number about ven on the penultimate. In the numerous allied species the spiral ribs have wider interspaces which e either plain or with an intermediate spiral. PROTOCONCH. Fig. N, 110, p. 196.

The shallow-water shells from the Falkland Islands usually seen in collections as '*liratus*' are *brucei* trebel, 1904. Compared with my interpretation of *liratus* these shells have wider spiral interspaces ith intermediates on the last whorl and the aperture is rather square and more capacious.

ymenopsis albidus (Philippi)

Fusus albidus Philippi, 1846, p. 119.
Trophon albidus Strebel, 1904, p. 222, pl. 7, fig. 64*a–d*.

YPE LOCALITY ?Magellanic

St. WS 71. 6 miles N 60° E of Cape Pembroke Lt., East Falkland Is., 23 Feb. 1927, 82 m.
St. WS 88. Off Staten I., Tierra del Fuego, 54° S, 65° W to 54° S, 64° 55′ W, 6 Apr. 1927, 118–118 m.
St. WS 97. Between Falkland Is. and Patagonia, 49° S, 62° W to 49° 01′ S, 61° 56′ W, 18 Apr. 1927, 146–145 m.
St. WS 222. South-east of Puerto Deseado, Patagonia, 48° 23′ S, 65° W, 8 June 1928, 100 m.
St. WS 243. Off Santa Cruz, Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.
St. WS 750. North-east of Falkland Is., 51° 50′ S, 57° 15′ 13″ W, 18/19 Jan. 1932, 135–144 m.
St. WS 805. Between Falkland Is. and Patagonia, from 50° 11′ S, 63° 27′ W to 50° 09·5′ S, 63° 31′ W, 6 Jan. 1932, 150–148 m.
St. WS 808. Off Santa Cruz, Patagonia, 49° 40′ 15″ S, 65° 42′ W, 8 Jan. 1932, 109–107 m.
St. WS 829. Between Falkland Is. and Patagonia, 50° 51′ S, 63° 13′ 30″ W, 31 Jan. 1932, 155 m.
St. WS 834. Off Bahia Grande, Patagonia, 52° 57′ 45″ S, 68° 08′ 15″ W, 2 Feb. 1932, 27–38 m.
St. WS 838. Between Falkland Is. and Patagonia, 53° 11′ 45″ S, 65° W, 5 Feb. 1932, 148 m.
St. WS 861. Off Puerto Deseado, Patagonia, 47° 40′ S, 64° 12′ W, 27 Mar. 1932, 117–124 m.
St. WS 863. Between Falkland Is. and Patagonia, 49° 05′ S, 64° 09′ W, 28 Mar. 1932, 121–117 m.
St. WS 865. Between Falkland Is. and Patagonia, 50° 03′ S, 64° 14′ W, 29 Mar. 1932, 126–128 m.
St. WS 867. Between Falkland Is. and Patagonia, 51° 10′ S, 64° 15′ W, 29 Mar. 1932, 137–144 m.
St. WS 869. Between Falkland Is. and Patagonia, 52° 15′ 30″ S, 64° 13′ 45″ W, 31 Mar. 1932, 187–0 m.

This shell, which is widely distributed in the deeper waters of the Falklands-Magellan area, is eferred to *albidus* on the basis of Strebel's interpretation (1904).

DENTITION. Fig. M, 90, p. 195 (St. 834).

ymenopsis falklandicus Strebel, Pl. IX, figs. 46, 47

Trophon falklandicus Strebel, 1908, p. 39, pl. 1, fig. 8*a–c*.
Trophon falklandicus Melvill & Standen, 1912, p. 354.

TYPE LOCALITY. Falkland Is., 7–40 m.

St. 55. Entrance to Port Stanley, East Falkland Is., 2 cables S 24° E of Navy Point, 16 May 1926, 10–16 m.
St. 56. Sparrow Cove, Port William, East Falkland Is., 1½ cables N 50° E of Sparrow Point, 16 May 1926, 10½–16 m.

Melvill & Standen (1912) consider this species doubtfully distinct from *paessleri* Strebel, 1904, from myth Channel, Strait of Magellan, but it is much nearer to, if not identical with *hoylei* Strebel 1904. As previously remarked, Strebel described so many closely similar Trophons of this group from the agellan Region that it is useless to attempt their evaluation without recourse to the type specimens.

Family MARGINELLIDAE

Genus **Marginella** Lamarck, 1799

Type (monotypy): *Voluta glabella* Linn.

Marginella warrenii Marrat, Pl. X, fig. 67.

Marginella warrenii Marrat, 1876, p. 136.
Marginella warrenii Tryon, 1883, p. 56.
Marginella hahni Mabille, 1884, p. 132.
Marginella hahni Rochebrune & Mabille, 1889, p. H 51, pl. 3, fig. 3*a*, *b*.
Marginella warrenii Tomlin, 1917, p. 305.

Type localities. Between Falkland Is. and Strait of Magellan, '50° 23′ 5″ N, 64° 0′ 4″ W (N cited in error for S latitude) (*warrenii*); between Strait of Magellan and Falkland Is. in 120 m (*hahni*).

St. WS 88. Off Le Maire Strait, Tierra del Fuego, 54° 00′ 00″ S, 64° 57′ 30″ W, 6 Apr. 1927, 118 m.
St. WS 212. North of Falkland Is., 49° 22′ 00″ S, 60° 10′ 00″ W, 30 May 1928, 242-249 m.
St. WS 213. North of Falkland Is., 49° 22′ 00″ S, 60° 10′ 00″ W, 30 May, 1928, 249–239 m.
St. WS 216. North of Falkland Is., 47° 37′ 00″ S, 60° 50′ 00″ W, 1 June 1928, 219–133 m.
St. WS 228. North-east of Falkland Is., 50° 50′ 00″ S, 56° 58′ 00″ W, 30 June 1928, 229–236 m.
St. WS 237. North of Falkland Is., 46° 00′ 00″ S, 60° 05′ 00″ W, 7 July 1928, 150–256 m.
St. WS 244. North-west of Falkland Is., 52° 00′ 00″ S, 62° 40′ 00″ W, 18 July 1928, 253–247 m.
St. WS 245. West of Falkland Is., 52° 36′ 00″ S, 63° 40′ 00″ W, 18 July 1928, 304–290 m.
St. WS 816. West of Falkland Is., 52° 09′ 45″ S, 64° 56′ 00″ W, 14 Jan. 1932, 150 m.
St. WS 820. North-east of West Falkland Is., 52° 53′ 15″ S, 61° 51′ 30″ W, 18 Jan, 1932, 351–367 m.
St. WS 867. Between Falkland Is. and Patagonia, 51° 10′ S, 64° 15·5′ W, 30 Mar. 1932, 150–147 m.

Range. Falkland Is. to Patagonia and Tierra del Fuego, 118–367 m.

Dentition. A number of examples were dissected but no radula was located.

This is a handsome shell over 20 mm. in height, highly glazed and white with two equally broa flesh-coloured spiral bands. By an initial error the locality was given as north instead of south latitud which credited the species to eastern Canadian waters until the error was discovered by Bavay (se Tomlin, loc. cit. p. 305).

Marginella dozei Rochebrune & Mabille, Pl. X, fig. 66

Marginella dozei Rochebrune & Mabille, 1889, p. H 52, pl. 3, fig. 4*a*, *b*.

Type locality. Between Strait of Magellan and Falkland Is. in 120 m.

St. 388. Between Cape Horn and Tierra del Fuego, 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m.

A similar species to *warrenii* but smaller and with a different colour pattern. There are two spira colour bands, the upper one being narrow and submargining the suture and the lower one occupyin most of the base.

Large, highly glazed Marginellids are usually of tropical occurrence.

Family VOLUTIDAE

Genus **Adelomelon** Dall, 1906

Type (o.d.): *Voluta ancilla* Solander

The vexed question of the type designation of Swainson's *Cymbiola* was dealt with in detail b Marwick (1926, pp. 263, 264). This requires pointing out, for Thiele (1931, p. 350) has persisted in th old interpretation of *ancilla* Solander as type of Swainson's *Cymbiola*. The actual genotype of *Cymbiol* wainson, 1832 is *C. broderipia* Swainson (n.nom. for *Voluta cymbiola* Swainson. Type by tautonomy). all's substitute name *Adelomelon*, 1906, is therefore the correct genus for the series of Magellan olutes centred around Solander's *ancilla*.

delomelon ancilla (Solander)

ncilla)

'Grand Buccin Magellanique', D'Avila, 1767, pl. 8, fig. S, no. 181.
Voluta ancilla, Solander, 1786, p. 137, no. 3061.
Voluta magellanica, Chemnitz, 1788, pp. 138–9 (exclusive of figures).
Voluta spectabilis, Gmelin, 1791, p. 3468. no. 142.
Voluta ancilla Lamarck, 1816, pl. 385, fig. 3.
Cymbiola ancilla Pace, 1902, p. 28, pl. 7, figs. 1–16.
Voluta ancilla Strebel, 1906, pl. 8, figs. 25 (copy of D'Avila's figure), 18, 20, 22, 23; pl. 9, figs. 37, 45, 50, 51.
Adelomelon ancilla Dall, 1906, p. 143.
Adelomelon ancilla Dall, 1907, p. 355.
Adelomelon ancilla Smith, 1942, p. 55, pl. 25, fig. 171.

magellanica)

Voluta magellanica Chemnitz, 1788, pp. 138–9 (in part), figs. 1383, 1384.
Voluta magellanica Gmelin, 1791, p. 3465, no. 110.
Voluta magellanica Kiener, 1839, pl. 51.
Voluta ancilla Reeve, 1849, pl. 17, fig. 39.
Voluta bracata Rochebrune & Mabille, 1889, p. 48.
Scaphella (*Voluta*) *arnheimi* Rivers, 1891, locality 'Monterey Bay, California' false.
Voluta ancilla with vars. *typica*, *ponderosa*, *elongata*, *expansa* and *abbreviata* Lahille, 1895, p. 311.
Voluta magellanica Strebel, 1906, pl. 8, figs. 17, 19, 21, 24–32; pl. 9, figs. 36 and 41.
Adelomelon magellanica Dall, 1907, p. 355.
Adelomelon magellanica Smith, 1942, p. 57, pl. 11, fig. 83.

(The above is an abridged synonomy.)

Most of the 'Discovery' volutes are more or less elongated shells without nodules. Larger series than I have available will be necessary to determine if *magellanica* is really distinct from *ancilla*. Variation is considerable, so much so that it is difficult to match individual specimens with the original figures. In several instances *ancilla* and *magellanica* forms are present in one dredging station, and more often than not, examples tend to combine in varying degrees the differentiating criteria set out by Dall (1889*a* p. 312). Dall stated that '*S. magellanica* is much like the *S. ancilla* from which it is chiefly distinguished by its smaller size, more slender form and usually fewer plaits'.

Since I am unable to draw a satisfactory line between *ancilla* and *magellanica* I have for the present referred the 'Discovery' material to the prior name. That is all the examples that range between the figure of D'Avila (1767) = *ancilla* and that of Chemnitz (1788) = *magellanica*.

TYPE LOCALITIES. Strait of Magellan (*ancilla* and *magellanica*).

St. 51. Off Eddystone Rock, East Falkland Is., 4 May 1926, 115 m.
St. 1902. Off Santa Cruz, Patagonia, 49° 48′ S, 67° 39·5′ W, 28 Nov. 1936, 50–30 m.
St. WS 71. 6 mile N 60° E of Cape Pembroke Lt., East Falkland Is., 23 Feb. 1927, 82–80 m.
St. WS 83. 14 miles S 64° W of George I., East Falkland Is., 52° 28′ S, 60° 06′ W to 52° 30′ 00″ S, 60° 09′ 30″ W, 24 Mar. 1927, 137–129 m.
St. WS 109. North of Falkland Is., 50° 19′ S, 58° 27′ W to 50° 18′ 36″ S, 58° 30′ W, 26 Apr. 1927, 145 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m. (two empty shells).
St. WS 247. North of Falkland Is., 52° 40′ S, 60° 05′ W, 19 July 1928, 172 m.
St. WS 776. Gulf of St George, Patagonia, 46° 18′ 15″ S, 65° 02′ 15″ W, 3 Nov. 1931, 50–80 m.

RANGE. Argentina, Patagonia, Straits of Magellan and Falkland Is., 0–172 m.

Tables A and B show the difficulty of recognizing more than one variable species with the 'Discovery' material.

Table A. Ancilla *and* magellanica *forms*

Height (mm.)	Diameter (mm.)	Ratio (aperture to total height)	Plaits	Station
212	76	1·6	3	1902
205	80	1·5	3	1902
180	78	1·4	3	WS 776
126	41	1·9	2	WS 83
120	39	1·8	2	WS 83
100	37	1·6	2	WS 109
96	34	1·7	2	WS 83
95	37	1·6	2	WS 109
82	32	1·8	2	WS 247

Table B. *Showing variation in individuals from the same station*

Height (mm.)	Diameter (mm.)	Spire ratio	Plaits	Fasciole	Protoconch	Station
141	45	1·8	2	Slight	Small	WS 71
123	55	1·48	3	Bulging	Large	WS 71
111	44	1·45	3	Bulging	Large	WS 243
93	35	1·85	2	Slight	Small	WS 243

If two forms require to be recognized, examples from St. 1902 and WS 776 conform with *ancilla* i being large with three plaits and a spire ratio ranging between 1·4 and 1·6. The remaining station represent the smaller *magellanica* form which is more slender has two plaits and a spire ratio rangin between 1·6 and 1·9.

However, in the writer's opinion, such arbitrarily selected criteria lose status when other varyin characters are considered, such as the relative size of the protoconch and the presence or otherwise o a bulging fasciole.

It has been pointed out by Dall (1919, pp. 207–34) and others that where several embryos develop i one egg capsule competition results in varying sizes in these embryos. In the New Zealand *Alcitho arabica* it has been noted that when a capsule develops two or more embryos they are invariably smal and in instances where only one persists it grows abnormally large.

It seems that in *Adelomelon ancilla* a small protoconch develops into a narrow tall-spired shell wit a slight fasciole development and two columellar plaits, and conversely a large protoconch is associate with a wider, short-spired shell, a bulging fasciole and three columella plaits.

Dentition. Pace (1902).

The radula is reduced to a row of tricuspid central teeth, as in most volutes.

Adelomelon mangeri (Preston)

Cymbiola mangeri Preston, 1901, p. 237, fig. in text.
Adelomelon mangeri Smith, 1942, p. 59, pl. 12, fig. 89.

Type locality. Falkland Is.

Off Jetty, Port Stanley, Falkland Is., 23 Mar. 1937, 1 m.

Height (mm.)	Diameter (mm.)	Ratio (aperture to total height)	Plaits	Station
103	56	1·3	3	(Holotype)
180	92	1·25	3	(Disc. II St.)
121	62	1·3	3	(Falkland Is.) (A.W.B.P. Coll.)

This seems to be a stable species so far known only from the Falkland Islands. It is characterized by s large, swollen body-whorl, short spire, large protoconch and lack of both nodules and colour pattern. It has apparently developed either as an inflated squat derivative of *ancilla* or more likely as a smooth atternless form of *subnodosa*.

Other species of *Adelomelon* recorded from the Magellan province are: *beckii* Broderip, 1836; *russacii* Donovan, 1824; *martensi* Strebel, 1906; and *tuberculata* Swainson, 1821.

Genus Miomelon Dall, 1907

Type (o.d.): *Volutilithes philippiana* Dall

Although it has several atypical features, the shell described below is probably correctly placed in *Miomelon*. The genus was proposed for a small Volute, 36·5 mm. in height, from 677 fathoms, south-est coast of Chile. The genotype is dark olivaceous-ash colour, with a tall spire equal to the height of e aperture, and the surface is sculptured with weak axial narrow folds and numerous half-obsolete piral striations. The columellar plaits number three, the anterior sinus is broad and very shallow, iere is no columellar callus plate and the fasciole is not margined. A very characteristic feature is the orm of the suture, which is deeply and narrowly channelled, but adpressed below by a distinct oncavity.

The new species described below has a short spire and the sculpture is almost obsolete, but the form f the suture, the plaits, absence of a columellar plate, weak, broad anterior notch and ill-defined asciole are the significant characters in accord with *Miomelon*.

The Chilean Tertiary Volutes, *d'orbignyana*, *domeykoana* and *gracilis* Philippi, *indurata* Conrad and *iplicata* Sowerby, were quoted as congeneric with *philippiana* by Dall (1907). The new species is not nlike the New Zealand *Palomelon* Finlay, 1926, but that genus lacks the channelled suture, has a more learly defined fasciole and no spiral sculpture.

Miomelon scoresbyana n.sp., Pl. IX, fig. 43

Shell small, solid, white, broadly fusiform with low conical spire 0·35 time height of aperture. Vhorls about six (protoconch eroded). Suture deeply and narrowly channelled and adpressed below by wide shallow concavity. Anterior notch broad and very shallow, fasciole defined only by the trend of he growth lines, not marked off in any way. Posterior notch deep, narrow and constricted, forming weak sutural sinus. Plaits three, strong and of equal development, or four if the anterior thickened dge of the columella is included. Sculpture consisting of very numerous but very weak axial growth ines and equally numerous subobsolete spiral threads. The parietal glaze is cream coloured and extends ialf-way across the front of the body-whorl.

Height 48·4 mm.; diameter 25·5 mm.

TYPE LOCALITY. St. WS 816. Between Falkland Is. and Strait of Magellan, 52° 09′ 45″ S, 64° 56′ W, 4 Jan. 1932, 150 m.

The animal has the foot rather pointed posteriorly, is comparatively smooth, and the tentacles are ong and tapered (10 mm.) with the eyes at the outer side of the bases. Dall found the eyes to be ibsent in the genotype, but the much greater depth at which it was taken (677 fathoms) would account or this absence.

The radula has not been removed, since it seems desirable to keep the only available animal intact. Experience has shown that the Volutid radula is almost invariably of the same type, that is, a single row of tricuspid central teeth.

The species is named in recognition of the many novelties obtained in the trawling surveys in Magellan waters from the R.R.S. *William Scoresby*.

Genus **Harpovoluta** Thiele, 1912

Type (monotypy): *Harpovoluta vanhoffeni* Thiele

Harpovoluta charcoti (Lamy)

Buccinum charcoti Lamy, 1910*b*, p. 318.
Buccinum charcoti Lamy, 1911*a*, p. 4, pl. 1, figs. 1, 2.
Harpovoluta charcoti Thiele, 1912, p. 271.
Volutharpa charcoti Smith, 1915, p. 72.
Volutharpa charcoti Eales, 1923, p. 33 (anatomy and radula).

TYPE LOCALITY. Off King George Sound, South Shetlands, 420 m.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, in 342 m.

RANGE. South Shetlands, 420 m.; Clarence I., 342 m.; off Oates Land, 180–200 fathoms (Smith 1915).

DENTITION. Eales (1923) gives a very full account of the anatomy, a figure of the dentition, an refers this shellfish to the Volutidae. For some unaccountable reason, however, Thiele's *Harpovolut* was suppressed by Smith and Eales in favour of *Volutharpa*, which is, however, definitely Buccinoi The radula in *charcoti* is typically Volutid, consisting of a tricuspid central tooth only.

Tomlin (1948, p. 229) recorded *Harpovoluta vanhoffeni* Thiele from 69 m. off Macquarie Islan

Genus **Provocator** Watson, 1882

Type (monotypy): *Provocator pulcher* Watson

Provocator cf. pulcher Watson

Provocator pulcher Watson, 1882, p. 330.
Provocator pulcher Watson, 1886, p. 260, pl. 13, fig. 5.

TYPE LOCALITY. Off Cumberland Bay, Kerguelen I. 105 fathoms. Between Kerguelen I. an Heard I., 150 fathoms (Challenger).

St. WS 245. Between Falkland Is. and Patagonia, 52° 36′ S, 63° 40′ W, 18 July 1928, 304–290 m.

The solitary 'Discovery' example is a juvenile of only three post-nuclear whorls, but it tallies well wit Watson's detailed description of the adult holotype. The holotype is about 90 mm. in height (3·6 in —the St. WS 245 example 32 × 14 mm. The present example has an excellently preserved 'Caricelli protoconch, the apical spike being prominent and curved to one side. The deep sutural sinus, concav smooth, enamelled subsutural band and delicately axially and spirally sculptured surface, are particular noticeable. In the holotype the outer lip bulges prominently outwards below the middle, but th 'Discovery' example lacks this feature, no doubt because this shell is juvenile.

The animal is very contracted in the one available juvenile, but the elongate-oval foot is shown to strongly rugose on the posterior upper surface, and the head is broad with two rather flattened sho stout tentacles. There are no eyes.

DENTITION. The radula is typically Volutid, consisting of a long series of the usual tricuspid centr tooth.

The finding of this genus in the Magellan Province represents a considerable westward extension the range of the genus, which previously was recorded only from the vicinity of Kerguelen and Hea Islands.

Genus Paradmete Strebel, 1908

Type (here designated): *Paradmete typica* Strebel

This Antarctic genus was ascribed by its author to the Cancellariidae, but Thiele (1929, p. 351) ured the radula which is very similar to that of the Boreal *Volutomitra*, an atypical member of the lutidae. Both *Paradmete* and *Volutomitra* have a spur-shaped central tooth and a pair of irregularly aped lateral plates, without cusps.

There are sufficient differences in detail, however, between the radulae of each to warrant retaining th genera at present, but that they have had a common ancestry is almost certain.

Thiele (1929, loc. cit.) evaluated these shells as follows:

Subfamily Volutomitrinae (of the Volutidae).
Genus *Volutomitra* H. & A. Adams, 1853.
Section *Volutomitra* (S.S.)
Section *Microvoluta* Angas, 1877 (=*Paradmete* Strebel, 1908).

Peile (1922, p. 18, text-fig. 8) figured and described the radula of the New South Wales *australis* ngas, the genotype of *Microvoluta*. This species has a central tooth more like that of *Paradmete* than at of *Volutomitra*, but differs from both in the absence of laterals. There is no marked similarity tween the relatively large and thin *Paradmete*, which has narrow, not very conspicuous columellar aits and the quite small, solid *Microvoluta*, with strong, very oblique plaits and a disproportionately ge, smooth, paucispiral protoconch. They should be kept separate until more is known concerning eir anatomy.

Unfortunately, the several living examples from the 'Discovery' material had been plunged into strong cohol and were too hardened and contracted to be worth dissecting.

aradmete fragillima (Watson)

Volutomitra fragillima Watson, 1882, p. 334.
Volutomitra fragillima Watson, 1886, p. 263, pl. 14, fig. 7.
Paradmete typica Strebel, 1908, p. 22, pl. 3, fig. 35*a–f*.
Paradmete typica Melvill & Standen, 1912, p. 357.
Volutomitra fragillima Smith, 1915, p. 74.

TYPE LOCALITIES. Royal Sound, 28 fathoms, Kerguelen I. (*fragillima*); South Georgia, 75 m. (*typica*).

St. 27. West Cumberland Bay, South Georgia, 3·3 m. S 44° E of Jason Lt., 15 Mar. 1926, 110 m.
St. 140. Stromness Harbour to Larsen Point, South Georgia, 54° 02′ S, 36° 38′ W to 54° 11′ 30″ S, 36° 29′ W, 23 Dec. 1926, 122–136 m.
St. 156. North of South Georgia, 53° 51′ S, 36° 21′ 30″ W, 20 Jan. 1927, 200–236 m.
St. 159. North of South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.
St. 190. Bismarck Strait, Palmer Archipelago, 64° 56′ S, 65° 35′ W, 24 Mar. 1927, 315 m.

RANGE. Kerguelen I., 28 fathoms (Watson); off Oates Land, 69° 43′ S, 163° 24′ E, 180–200 fathoms mith); South Georgia, 24–310 m. (Strebel and 'Discovery'); Palmer Archipelago, 315 m. ('Discovery') d Burdwood Bank, 56 fathoms (Melvill & Standen).

I have seen only South Georgian and Palmer Archipelago material, but Smith (1915) remarked that he Kerguelen shell figured by Watson has a much shorter spire than other specimens from the same cality which agree perfectly with Strebel's figure of *Paradmete typica*'.

aradmete longicauda Strebel

Paradmete longicauda Strebel, 1908, p. 24.

TYPE LOCALITY. South Georgia, 54° 22′ S, 36° 27′ W, 95 m.

St. 27. West Cumberland Bay, South Georgia, 3·3 miles S 44° E of Jason Lt., 15 Mar. 1926, 110 m.

This species has only two columellar plaits, whereas *fragillima* has four. There is a third member of the genus, *Paradmete curta* Strebel (1908), from off Shag Rock Bank, north of South Georgia, in 160 m.

Melvill & Standen's *Mitra* (*Volutomitra*) *porcellana* (1912) from Scotia Bay, 9–10 fathoms, South Orkneys, is not congeneric and will probably prove to be a *Marginella*.

Paradmete percarinata n.sp., Pl. IX, fig. 57

Shell broadly ovate, with a prominent peripheral carina, a flat shoulder, and a short, tabulated spire. Whorls four, exclusive of the protoconch, which is missing. Spire-whorls with the carina slightly below the middle, the flat-sloping shoulder with the upper half smooth and the lower half with five to six linear-spaced, weak, spiral threads; the area below the carina straight, slightly undercut, and sculptured with four to six linear-spaced spirals. Body-whorl and base with about forty-five spirals between the carina and the fasciole, which is devoid of spirals. Axial sculpture confined to weak, irregular growth lines. Aperture long and narrow, produced below into a short anterior canal. Outer lip thin, inner lip with three columella plaits, upper two well developed, lowest one weak.

Height 16·5 mm. (estimated, 17 mm.); diameter 10·5 mm.

TYPE LOCALITY. St. 1957. Off south side of Clarence I., 7 miles east of Cape Bowles, South Shetland Is., 3 Feb. 1937, 785–810 m. (one empty shell).

In form this species closely resembles *Cancellaria* (*Admete*) *carinata* Watson (1886, pl. 18, fig. 9) from Kerguelen Island in 28 fathoms, but Watson's species has 'two indistinct folds' on the pillar, which suggests that it is correctly placed in the Cancellariidae. The well-developed plaits in *percarinata*, on the other hand, are of similar style and strength to those of both *fragillima* and *longicauda*.

Paradmete crymochara (Rochebrune & Mabille)

Mitra crymochara Rochebrune & Mabille, 1885, p. 102.
Mitra crymochara Rochebrune & Mabille, 1889, p. H 49, pl. 3, fig. 1.

TYPE LOCALITY. South-east of Tierra del Fuego, 220 m.

St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m. (two empty shells).

Height 12·0 mm.; diameter 6·0 mm. (holotype).

Height 20·5 mm.; diameter 7·25 mm. (St. 388).

Although the 'Discovery' specimens are much larger than the holotype of *crymochara* they seem to be the adult of that species. The shell is narrowly ovate-fusiform, has a smooth papillate protoconch of 2½ whorls, the tip asymmetrical, four well-developed plaits on the pillar, a weakly defined shoulder bearing three fine spiral threads and dense subobsolete spiral lirations over the remainder of the whorls. The whole shell is covered with a thin, pale buff epidermis.

Family CANCELLARIIDAE

Genus **Admete** Kroyer, 1842

Type (monotypy): *Admete crispa* Moeller, 1842

Admete magellanica Strebel

Admete magellanica Strebel, 1905*b*, p. 594, pl. 22, fig. 29*a–d*.
Admete magellanica Melvill & Standen, 1907, p. 111.

TYPE LOCALITY. Smyth Channel, Strait of Magellan.

St. WS 84. 7½ miles S 9° W of Sea Lion I., East Falkland Is., 52° 33′ S, 59° 08′ W to 52° 34′ 30″ S, 59° 11′ W, 24 Mar. 1927, 75–74 m.
St. WS 228. North-east of Falkland Is., 50° 50′ S, 56° 58′ W, 30 June 1928, 229–236 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1928, 144–141 m.

St. WS 244. West of Falkland Is., 52° S, 62° 40′ W, 18 July 1928, 253–247 m.
St. WS 250. North of Falkland Is., 51° 45′ S, 57° W, 20 July 1928, 251–313 m.
St. WS 797. North-west of Falkland Is. to Patagonia, 51° 06′ S, 64° 10′ 30″ W to 47° 47′ 43″ S, 64° 07′ 30″ W 19 Dec. 1931, 117 m.
St. WS 801. North-west of Falkland Is. to Patagonia, 48° 26′ 15″ S, 61° 28′ W, 22 Dec. 1931, 165–165 m.

RANGE. Many localities around Strait of Magellan, 10–20 fathoms (Strebel); Port Stanley, Falkland , shore (Melvill & Standen).

The carinate form figured by Strebel (1905*b*, fig. 29*b*) was not encountered. The example from WS 250 has finer and more numerous spiral ribs, fourteen on the penultimate, but eight to eleven irals is characteristic of the other 'Discovery' material. Strebel's figures show a variation of between e and nine penultimate spirals.

This species is not dissimilar from the boreal genotype, and like it has neither radula nor operculum.

lmete cf. antarctica Strebel

Admete antarctica Strebel, 1908, p. 21, pl. 4, fig. 44*a–c*.

TYPE LOCALITY. South-west of Snow Hill I., 64° 36′ S, 57° 42′ W, 125 m.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m. (one living example).
St. 175. Bransfield Strait, South Shetland Is., 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.

The St. 170 example is only 7 mm. in height compared with 11·6 mm. for Strebel's type, but it is alf-whorl smaller and evidently not fully grown. The weak shoulder carination is slightly stronger an shown in Strebel's figure, but the number of spiral ribs is approximately the same.

lmete consobrina n.sp. Pl. X, fig. 63

Shell small, thin, translucent with a pale buff epidermis; ovate with a carinated shoulder. Spire less an one-third height of aperture. Whorls about $4\frac{1}{2}$, protoconch small, eroded in only specimen. ulpture consisting of distinct flat-topped spiral cords with interspaces varying from linear to half the dth of the cords. The peripheral cord is strongest, and there are five cords above it and four below it the spire-whorls and about thirty on the body-whorl from below the carina. The columella is mooth vertical callus slightly flexed at the anterior canal and bears two very weak plications. Aperture rrowly ovate-pyriform. Outer lip thin and delicately corrugated by the external sculpture.

Height 9·75 mm.; diameter 6·6 mm.

TYPE LOCALITY. St. 159. North of South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.

It is very similar to *Cancellaria* (*Admete*) *carinata* Watson from Kerguelen Island, 28 fathoms, but at species has a smooth shoulder and only two spiral cords between the carina and the lower suture.

Family TURRIDAE

Genus **Aforia** Dall, 1889

Type (o.d.) *Pleurotoma circinata* Dall = *Irenosyrinx* Dall, 1908

Grant & Gale (1931, p. 508) have pointed out that there is no obvious distinction between *Aforia* d *Irenosyrinx*. Dall (1889) stated that *Aforia* was without an operculum but according to Grant Gale (loc. cit.) it has since been shown to have one. The type of *Aforia* is from the Bering Sea in deep ter and that of *Irenosyrinx*, *Pleurotoma* (*Leucosyrinx*) *goodei* Dall, is from north-west of Patagonia in 50 fathoms.

oria magnifica (Strebel)

Surcula magnifica Strebel, 1908, p. 19, pl. 2. fig. 23*a–d*.

TYPE LOCALITY. South-west of Snow Hill I., 64° 20′ S, 56° 38′ W, 150 m.

St. 182. Schollaert Channel, Palmer Archipelago, 64° 21′ S, 62° 58′ W, 14 Mar. 1927, 278–500 m.
St. 195. Admiralty Bay, King George I., South Shetland Is., 62° 07′ S, 58° 28′ 30″ W, 391 m.
St. 363. 2·5 miles S 80° E of south-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–278 m.
St. 1952. Between Penguin I. and Lion's Rump, King George I., South Shetland Is., 11 Jan. 1937, 367–382 m.

Height 63·0 mm.; diameter 22·8 mm. (holotype).

Height 63·0 mm.; diameter 22·0 mm. (St. 195).

DENTITION. Fig. M, 91, p. 195. St. 182. 1+0+1+0+1. Central tooth large and broad with a convex upper margin and a single small cusp in the centre. The single series of marginals are composed of large approximately shuttle-shaped teeth, tapered to a single point, and without serrations or denticles. The absence of laterals has enabled a great increase in the size and lateral spread of the central.

A very similar type of radula is found in *Ptychosyrinx bisinuata* (Martens) (Thiele, 1931, p. 359) and *Leucosyrinx crispulata* Martens (Thiele, loc. cit.).

This species and *Fusitriton cancellatum*, both of which belong to groups with an extensive western American range, show how the continuity of the western coasts of the Americas has been and still is a supply route to the Antarctic waters of the Weddell Quadrant.

Aforia goniodes (Watson)

Pleurotoma clara Martens, 1880, 35, pl. 8, fig. 1 (non *Pl. clara* Reeve, 1845).
Pleurotoma (*Surcula*) *goniodes* Watson, 1881, p. 394.
Pleurotoma (*Surcula*) *goniodes* Watson, 1886, pl. 20, fig. 4.
Leucosyrinx goniodes (=*clara*) Martens & Thiele, 1903, p. 90.

TYPE LOCALITIES. Patagonia, 60 fathoms (*clara*); south-east of Rio de la Plata, Argentina, 600 fathoms (*goniodes*).

St. WS 867. Between Falkland Is. and Grande Bay, Patagonia, 51° 10′ S, 64° 15·5′ W, 30 Mar. 1932, 150–147 m.

One empty shell, 37 × 15 mm.

Genus **Leucosyrinx** Dall, 1889

Type (o.d.): *Pleurotoma verrilli* Dall, North Carolina to Gulf of Mexico. 150–850 fathoms

I have included the two following species in *Leucosyrinx* in preference to *Aforia* because the anal sinus is broad, occupying most of the shoulder, and the species lack the strong peripheral carina which is so characteristic of *Aforia*. Unfortunately, none of the specimens contained the animal. Both *Aforia* and *Leucosyrinx* belong to the subfamily Cochlespirinae.

Leucosyrinx paratenoceras n.sp., Pl. IX, fig. 54

Shell large, elongate fusiform, with a long, slender spire; lightly convex whorls, except for a concave shoulder; white, covered with a thin, shining, almost colourless, faintly iridescent epidermis and sculptured with closely spaced spiral cords, most of which finally become bifid. Whorls eight, including a smooth papillate protoconch of about two whorls with a small erect central nucleus. Spire tall and narrow, about $1\frac{1}{3}$ times height of aperture plus canal. Post-nuclear sculpture consisting of one or two weak spiral threads near the outer extremity of the otherwise smooth shoulder and seven or eight strong, flat-topped spiral cords between the shoulder angle and the lower suture. About twenty-six cords on the body-whorl plus about ten closely spaced fine threads on the fasciole. Most of the cords on the later whorls are bifurcated by linear grooves. There is no true axial sculpture apart from numerous irregular growth lines. Aperture elongate-oval and produced below into a relatively short and straight spout-like anterior canal. Sinus concave, occupying the whole of the shoulder. Outer lip oduced forwards in a considerable arcuate sweep. Parietal and columellar callus smooth, porcellanous, d abruptly marked off from the surface sculpture.

Height 38·75 mm.; diameter 11·5 mm. (St. 1952, holotype).

Height 43·5 mm.; diameter 13·0 mm. (St. 1957).

TYPE LOCALITY. St. 1952. Between Penguin I. and Lion's Rump, King George I., South Shetland, Is., Jan. 1937, 367–382 m.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m.
St. 175. Bransfield Strait, South Shetlands Is., 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.
St. 182. Schollaert Channel, Palmer Archipelago, 64° 21′ S, 62° 58′ W, 14 Mar. 1927, 278–500 m.
St. 1957. Off south side of Clarence I., 7 miles east of Cape Bowles, South Shetlands Is., 3 Feb. 1937, 785–810 m.

In its slender form the species resembles *Leucosyrinx tenoceras* Dall from off Gaudeloupe in 3 fathoms (1889*b*, p. 76, pl. 36, fig. 5).

ucosyrinx paragenota n.sp., Pl. IX, fig. 56

Shell of similar shape and proportions to *paratenoceras*, but smaller, with finer and more numerous iral cord-sculpture, the whole of the shoulder spirally lirate, a shorter anterior canal and a much more ominent fasciole. Whorls seven, including a rather large papillate protoconch of 1½ smooth whorls us a brephic half-whorl of closely spaced sinuous axials. Post-nuclear sculpture consisting of closely aced spirals crossed by numerous oblique axials. Five weak spiral threads on the narrow concave oulder, nine to fourteen flat-topped, linear-spaced cords from the shoulder to the lower suture, and out thirty-six on the body whorl from the shoulder to the fasciole, which bears approximately further fourteen spirals, but they are closely spaced, weak and ill-defined threads. Axials narrow, otractively oblique and extending from the shoulder to the lower suture, eighteen to twenty per orl, but subobsolete on the body-whorl. Aperture narrow, with a very short, spout-like anterior nal. Anal sinus deeply concave, occupying the whole of the shoulder. Outer lip produced forwards a considerable arcuate sweep. Fasciole prominently bulging, commencing above the middle of the erture. Parietal and columellar callus smooth and porcellanous, abruptly marked off from the ternal sculpture and not interrupted by the fasciole. Colour white, covered with a thin, buff-coloured idermis.

Height 21·25 mm.; diameter 7·5 mm. (holotype, St. 652).

TYPE LOCALITY. St. 652. Burdwood Bank, south of Falkland Is., 54° 04′ S, 61° 40′ W, 14 Mar. 1931, 1–169 m. PROTOCONCH. Fig. N, 113, p. 196.

ucosyrinx falklandica n.sp., Pl. IX, fig. 55

Shell very similar to *paragenota*, but with a larger, more bulbous protoconch, a smooth shoulder and inconspicuous fasciole. Whorls six, including a large, bluntly rounded smooth protoconch of two orls, followed by a half-whorl of closely spaced, strong, brephic axials. Post-nuclear spiral sculpture nsisting of flat-topped, linear-spaced, spiral cords, extending from the shoulder to the lower suture, ne to eleven on the spire-whorls and about forty on the body-whorl including the ill-defined ciole. Axials prominent, protractively oblique, commencing at the shoulder, but becoming obsolete wards the lower suture and on the last half-whorl. Colour white, covered by a pale buff epidermis. ertural features and sinus as in the above two species.

Height 15·75 mm.; diameter 5·8 mm.

TYPE LOCALITY. St. WS 871. North of Falkland Is., 53° 16′ S, 64° 12′ W, 1 Apr. 1932, 336–342 m. e example only). PROTOCONCH. Fig. N, 112, p. 196.

Genus **Belaturricula** n.g.

Type: *Bela turrita* Strebel

This genus is provided for a large narrowly fusiform species with a tall spire, a bluntly rounded, paucispiral smooth protoconch, a short straight spout-like anterior canal and a very shallow Turriculid style of anal sinus, with the outer lip very little produced and parallel to the axis of the shell. The dentition is not known, nor has it been determined if an operculum is present or not.

The type species seems to be very similar to Watson's *Pleurotoma* (*Surcula*) *dissimilis* (1886, p. 298, pl. 26, fig. 3) from south-east of the Philippine Islands in 500 fathoms.

Strebel's shell has no resemblance to '*Bela*' auct., which name has long served as a dumping ground for species of uncertain affinity.

The sinus in the St. 159 example, recorded below, although shallow, is much more distinct than shown in Strebel's figure.

Belaturricula turrita (Strebel)

Bela turricula Strebel, 1908, p. 18, pl. 3, fig. 32*a–c*.

TYPE LOCALITY. Shag Rock Bank, west of South Georgia, 53° 34′ S, 43° 23′ W, 160 m.

St. 159. Off Cumberland Bay, South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.

One empty shell, 50 × 17·5 mm., compared with 60 × 21 mm. for Strebel's holotype.

Genus **Conorbela** n.g.

Type: *Bela antarctica* Strebel

A new genus is required for this shell, which has little in common with the several other Antarctic and Subantarctic species ascribed to '*Bela*' auct. by Strebel (1908).

The shell is comparatively large, thin and ovate-biconic with a prominent, flat, sloping shoulder defined by a rounded peripheral keel. The protoconch, so far as can be judged from available material, is relatively large, dome-shaped and paucispiral. The anterior canal is spout-like, very little produced but slightly constricted by a spiral termination to the smooth, arcuate columella. The posterior sinus is a broad, very shallow arc extending from the suture to the peripheral keel. The operculum is irregularly ovate, with a terminal nucleus, vestigial, occupying only a third the linear dimensions of the aperture. No radula was located.

The form of the sinus suggests relationship with the Conorbiinae and the presence of an operculum disassociates it from *Gymnobela*, the only other Turrid genus of similar form. Except for the lack of columellar plaits and the shallow but definite posterior sinus, *Conorbela* resembles the Cancellarid *Admete carinata* Watson and the Volutid, *Paradmete percarinata* n.sp.

Conorbela antarctica (Strebel)

Bela antarctica Strebel, 1908, p. 16, pl. 3, fig. 30*a*, *b*.

TYPE LOCALITY. South-west of Snow Hill I., 64° 36′ S, 57° 42′ W, 125 m.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m. (one old eroded shell).

St. 363. 2·5 miles S 80° E of south-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–278 m. (three living but somewhat eroded examples).

Genus **Lorabela** n.g.

Type: *Bela pelseneri* Strebel

Bartsch (1941) reviewed the Boreal Turrids of the groups previously ascribed to *Bela*, *Lora*, *enopota* and *Propebela* and proposed ten new genera and subgenera. He explained, as I did, inde-endently (Powell, 1942, pp. 9, 12 and 16), that *Bela* Gray, 1847, applies to the Mangeliinae and *Lora* istel, 1848, was proposed as a n.nom. for the preoccupied *Defrancia* Millet, 1826 = *Pleurotomoides* ronn, 1831, an Italian Miocene member of the Mangeliinae. The available names for the '*Bela*' ct. shells are thus restricted to *Oenopota* Moerch, 1852, *Propebela* Iredale, 1918, and the ten new ropositions of Bartsch.

A group of Antarctic shells, typified by the South Georgian *Bela pelseneri*, resembles the boreal *ropebela* in build and adult sculptural plan of strong axials crossed by regular spiral cords, but has smooth, paucispiral protoconch and a deep rounded anal sinus occupying the shoulder.

The protoconch in *Propebela* has a smooth initial whorl followed by one bearing spiral threads and ally a brephic stage with the spirals crossed by weak, closely spaced axial riblets. The anal sinus is so allow that it is scarcely apparent.

The genotype of *Lorabela* has a vestigial, thin, oval operculum with a terminal nucleus and radula ry similar to that of *Propebela turricula*, which consists of bundles of slender, twisted rods.

orabela pelseneri (Strebel, 1908)

Bela pelseneri Strebel, 1908, p. 15, pl. 2, fig. 27 *a*, *b*.

TYPE LOCALITY. Cumberland Bay, 252–310 m., South Georgia.

St. 45. 2·7 miles S 85° E of Jason Lt., South Georgia, 6 Apr. 1926, 238–270 m.

St. 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m.

orabela notophila (Strebel)

Bela notophila Strebel, 1908, p. 16, pl. 2, fig. 28*a*, *b*.

TYPE LOCALITY. Cumberland Bay, 252–310 m., South Georgia.

St. 123. Off mouth of Cumberland Bay, South Georgia, from 4·1 miles N 54° E of Larsen Point to 1·2 miles S 62° W of Merton Rock, 15 Dec. 1926, 230–250 m.

St. 149. Mouth of East Cumberland Bay, South Georgia, from 1·15 miles N 76½° W to 2·62 miles S 11° W of Merton Rock, 10 Nov. 1927, 200–234 m.

St. WS 27. Off northern end of South Georgia, 53° 55′ S, 38° 01′ W, 19 Dec. 1926.

PROTOCONCH. Fig. N, 114, p. 196.

orabela plicatula (Thiele)

Bela plicatula Thiele, 1912, p. 215, pl. 14, fig. 4.

TYPE LOCALITY. St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

Genus **Belalora** n.g.

Type: *Belalora thielei* n.sp.

This genus resembles *Propebela* in build and adult sculpture, but has a relatively larger, more dome-aped protoconch consisting of a smooth planorbid tip, a whorl of closely spaced spiral threads and, ally, a whorl of spiral ribs crossed by axial threads. As in the previous genus, *Lorabela*, the posterior nus is deep and rounded. There is a vestigial oval operculum with a terminal nucleus. Theile's *Bela riatula* (1912, p. 215, pl. 14, fig. 3), from Gauss Station, Davis Sea, belongs to this genus. It has the me style of protoconch as *thielei*, but the post-nuclear axials are more numerous.

Belalora thielei n.sp., Pl. VI, fig. 20

Shell small, biconic, with turreted spire and sculptured with strong axials and dense spiral lirations. Whorls six, including a relatively large, bulbous to dome-shaped sculptured protoconch of three whorls, as described above. Spire equal to height of aperture plus canal. Spire-whorls with a prominent slightly concave shoulder; outline steep from below the shoulder and sculptured with prominent, bluntly rounded, slightly protractively oblique axials, fourteen on the penultimate and fifteen on the body-whorl. All post-nuclear whorls crossed by dense spiral lirations, six to eight weak spirals on the shoulder and twelve strong spirals from the shoulder to the lower suture of the spire-whorls. Body-whorl, including base, with about fifty-eight spirals, much finer on the shoulder, the fasciole, and neck. Aperture narrowly ovate-pyriform with a short, broad anterior canal and a deeply concave posterior sinus, occupying the shoulder. Inner lip strengthened by a massive, smooth, rounded parietal-columellar callus, which is separated from the base by a narrow excavated area. There is a conspicuous, bulging fasciole.

Height 7·1 mm.; diameter 3·7 mm. (holotype, St. WS 801).

TYPE LOCALITY. St. WS 801. North-west of Falkland Is. to Patagonia, 48° 26′ 15″ S, 61° 28′ W, 22 Dec. 1931, 165–165 m.

St. WS 216. North of Falkland Is., 47° 37′ S, 60° 50′ W, 1 June 1928, 219–133 m.

St. WS 797. North-west of Falkland Is. to Patagonia, 51° 06′ S, 64° 10′ 30″ W. to 47° 47′ 43″ S, 64° 07′ 30″ W, 19 Dec. 1931, 117 m.

St. WS 808. From 49° 41′ S, 65° 40′ W to 49° 39·5 S, 65° 44′ W, 8 Jan. 1932, 110–106 m.

PROTOCONCH. Fig. N, 115, p. 196.

Genus **Pleurotomella** Verril, 1873

Type (monotypy): *Pleurotomella packardi* Verril Recent, north-east coast of U.S.

The first species recorded below has a three-whorled, conical, pale brownish, 'sinusigerid' protoconch, a Daphnellid reversed L-shaped sinus and general features closely similar to the north-east American genotype. Dall (1889*b*, pp. 119–26) has described or recorded a number of deep-water species from the West Indies. He accounts for the presence of two types of protoconch in the genus by a suggestion that the smooth, shelly nucleus is an infilling of a horny 'sinusigerid' envelope which has subsequently weathered away (loc. cit. p. 124).

The remaining two species recorded below have this blunt, white, shelly, few-whorled protoconch, and the *ohlini* material, several of which contain the animal, resemble typical *Pleurotomella* in the lack of an operculum.

Pleurotomella simillima Thiele

Pleurotomella simillima Thiele, 1912, p. 216, pl. 14, fig. 8.

TYPE LOCALITY. Gauss Station, Davis Sea.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m. (one empty shell).

PROTOCONCH. Fig. N, 117, p. 196.

Pleurotomella? ohlini (Strebel)

Thesbia ohlini Strebel, 1905*b*, p. 592, pl. 22, figs. 22, 22*a*.

TYPE LOCALITY. Fortescue Bay, 10–12 fathoms, Strait of Magellan.

St. WS 212. North of Falkland Is., 49° 22′ S, 60° 10′ W, 30 May 1928, 242 m.

St. WS 228. North-east of Falkland Is., 50° 50′ S, 56° 58′ W, 30 June 1928, 229–236 m.

St. WS 244. West of Falkland Is., 52° S, 62° 40′ W, 8 July 1928, 253–247 m.

PROTOCONCH. Fig. N, 116, p. 196.

eurotomella? anomalapex n.sp., Pl. VI, fig. 19

Shell small, white, fusiform with strongly convex and weakly shouldered whorls, sculptured with ıse, wavy, spiral lirations and protractively arcuately oblique axials. Whorls five, including a blunt ıcispiral, smooth protoconch of two whorls. Spire-whorls sculptured with ten to twelve spirals, dy-whorl including base and neck with about forty-spirals, shoulder without spirals. Axial sculpture narrowly rounded, oblique axials, which commence strongly at the shoulder, but become subobsolete er the lower half of the whorls. There is a weak surface pattern also, of dense axial threads which are ore apparent on the otherwise smooth concave shoulder. The posterior sinus is deep, Daphnellid versed L-shaped, and the outer lip swings forward in an arcuate sweep. The anterior canal is sharp and mparatively straight, its length emphasized by the relatively long neck, resulting from an excavated se.

Height 7·8 mm.; diameter 3·9 mm.

TYPE LOCALITY. St. WS 225. Between Falkland Is. and Patagonia, 50° 20′ S, 62° 30′ W, 9 June 1928, 2–161 m. (holotype only).

The species resembles *ohlini*, but has the addition of well-developed axials. Although both these ecies lack the sinusigerid protoconch of the genotype, the adult characters of build and sinus are in cord with *Pleurotomella*. I have already referred to Dall's view that some Turrids commence with horny sinusigerid envelope which wears off and leaves a limy mould in its place. The somewhat egular shape and minute surface malleations of the nucleus in two of the above species, and especially e raised terminal varix, seem to be in accord with Dall's explanation.

Genus **Eumetadrillia** Woodring, 1928

Type (o.d.): *Agladrillia* (*Eumetadrillia*) *serra* Woodring Miocene, Jamaica

The shells which I have referred below to Smith's unfigured *fuegiensis* seem to represent the adult of at species. They certainly tally with Smith's description better than they do with any other Magellanic *rillia*' known to me, and most of them have been adequately figured by Strebel (1905, 1908).

The shells before me match Smith's description in every particular—protoconch, number and ry oblique trend of the axials, which are thickest above, smooth concave shoulder, aperture two-fifths e total height, sinus deep, and even the purplish pink colour. Also, young examples approximate to e dimensions cited by Smith.

The generic location seems to fall between the Recent and Tertiary Austro-Neozelanic *Splendrillia* edley, 1922, and Woodring's *Eumetadrillia*, with more leaning towards the latter.

The protoconch is large, broad and dome-shaped as in *Splendrillia*, but the shoulder is entirely free om the subsutural spiral fold which is so characteristic of that genus. Although the protoconch in *ımetadrillia* is rather slender the smooth concave shoulder and general features of build and axial bbing are in accord with those features in the Magellanic shell.

Most of the 'Discovery' shells have a very weak parietal callus, but in one aged example this feature quite as well developed as in Woodring's genotype.

ımetadrillia fuegiensis (Smith)

Pleurotoma (*Surcula*) *fuegiensis* Smith, 1888, p. 300.

TYPE LOCALITY. Strait of Magellan.

St. WS 85. 8 miles S 66° E of Lively I., East Falkland Is., 52° 09′ S, 58° 14′ W to 52° 08′ S, 58° 09′ W
25 Mar. 1927, 79 m.

St. WS 88. Off north of Staten I., 54° S, 64° 57′ 30″ W, 6 Apr. 1927, 118 m.

St. WS 95. Between Falkland Is. and Patagonia, 48° 57′ S, 64° 45′ W to 48° 59′ 30″ S 64° 45′ W, 17 Apr. 1927, 109–108 m.
St. WS 222. Between Falkland Is. and Patagonia, 48° 23′ S, 65° W, 8 June 1928, 100–106 m.
St. WS 243. Between Falkland Is. and Patagonia, 51° 06′ S, 64° 30′ W, 17 July 1924, 144–141 m.
St. WS 764. Between Falkland Is. and Argentina, 44° 38′ 15″ S, 61° 58′ 30″ W, 17 Oct. 1931, 110–104 m.
St. WS 787. Off Patagonia, 48° 44′ S, 65° 24′ 30″ W, 7 Dec. 1931, 106–110 m.
St. WS 808. Off Santa Cruz, Patagonia, 49° 40′ 15″ S, 65° 42′ W, 8 Jan. 1932, 109–107 m.
St. WS 838. Between Falkland Is. and Tierra del Fuego, 53° 11′ 45″ S, 65° W, 5 Feb. 1932, 148 m.

Height 11·5 mm.; diameter 4·0 mm. (holotype).
Height 10·5 mm.; diameter 4·25 mm. (St. WS 95).
Height 17·5 mm.; diameter 6·25 mm. (St. WS 243).
Height 20·3 mm.; diameter 6·5 mm. (St. WS 88).

PROTOCONCH. Fig. N, 118, p. 196.

Genus **Typhlodaphne** n.g.

Type: *Bela purissima* Strebel, 1908

The relationships of this genus are puzzling. It has a bluntly rounded, smooth, paucispiral protoconch of two whorls, with an asymmetrical nucleus, a type found in any of the subfamilies. The sinus is most like that of *Daphnella* in being subsutural, steeply descending and then produced forward at an angle to meet the arcuately produced outer lip, but the presence of an operculum is foreign to the Daphnellinae. The dentition consists of paired marginals only, of the awl-shaped Conid type, not the hilted dagger form, characteristic of the '*Bela*' complex, but very similar to those of *Phenatoma* (Clavinae).

In several respects, shape, sinus and dentition, *Typhlodaphne* closely resembles *Typhlosyrinx vepallida* Martens, 1903, from 1840 m. in the Gulf of Aden, but that genus lacks an operculum and has a globular initial whorl to its smooth, paucispiral protoconch.

Since the only important difference between *Typhlodaphne* and *Typhlosyrinx* is the presence of an operculum in the former and its absence in the latter, I feel that the placing of a high taxonimic value upon the presence or absence of an operculum would sever what appears to be rather close relationship. Admittedly one of the criteria used in the segregation of the Mangeliinae and the Daphnellinae is the absence of an operculum, but in the case of *Typhlodaphne* the operculum is of vestigial size and may well reflect an archaic condition just as some members of the Clavinae preserve the prototypic complete dental formula of central, lateral and marginal teeth.

Both *Typhlodaphne* and *Typhlosyrinx* are here referred to the Daphnellinae mainly on the evidence of the sinus, which is of a type seemingly excusive to that subfamily.

Typhlodaphne purissima (Strebel)

Bela purissima Strebel, 1908, p. 17, pl. 3, fig. 31*a–d*.

TYPE LOCALITY. Off Shag Rocks, west of South Georgia, 160 m.

St. 159. Off Cumberland Bay, South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m.
St. 160. Near Shag Rocks, west of South Georgia, 53° 43′ 40″ S, 40° 57′ W, 7 Feb. 1927, 177 m.

DENTITION. Fig. M, 92, p. 195 (St. 159).

PROTOCONCH. Fig. N, 119. OPERCULUM. Fig. N, 130, p. 196.

Typhlodaphne strebeli n.sp., Pl. IX, fig. 53

This species differs from the glossy, milk-white *purissima* in being uniformly warm-buff, more slender, with a smaller protoconch and with flexuous, subobsolete axials over all post-nuclear whorls. Shell elongate ovate-fusiform, with a tall spire, slightly less than height of aperture plus canal. Whorls

, including a small, smooth, papillate protoconch of 1½ whorls. Post-nuclear sculpture of narrow, xuous, protractive, closely spaced axials, commencing just below the slightly concave shoulder, but coming subobsolete towards the lower suture and on the base of the body-whorl. The axials number om eighteen to twenty-four on the spire-whorls. Sinus subsutural, occupying the shoulder, steeply scending at first and then produced forwards in the arcuate sweep of the outer lip. Aperture narrowly ate with a rounded, broadly channelled anterior end not constricted and scarcely differentiated. rface with numerous microscopic spiral lirations, not distinct enough to be counted.

Height 20·0 mm.; diameter 7·25 mm. (holotype).

Height 24·5 mm.; diameter 10·0 mm. (St. 160=topotype of *purissima*).

Type locality. St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09¾ W, 16 Apr. 1930, 1 m.

yphlodaphne translucida (Watson)

Pleurotoma (*Thesbia*) *translucida* Watson, 1881, p. 444.
Pleurotoma (*Thesbia*) *translucida* Watson, 1886, p. 330, pl. 25, fig. 11.
Thesbia translucida Thiele, 1912, p. 248.

Type locality. Half-way between Marion I. and Prince Edward I., 140 fathoms.

St. 1563. Between Marion I. and Prince Edward I., 46° 48·4′ S, 37° 49·2′ E, 7 Apr. 1935, 113–99 mm. (one empty shell).

yphlodaphne filostriata (Strebel)

Thesbia filostriata Strebel, 1905*b*, p. 591, pl. 22, figs. 21, 21*a*.

Type locality. Borja Bay, 10 fathoms, Strait of Magellan.

St. 388. Between Cape Horn and Staten I., 56° 19½′ S, 67° 09¾′ W, 16 Apr. 1930, 121 m. (two empty shells).

Family ACTEONIDAE

Genus **Acteon** Montfort, 1810

Type (monotypy): *Acteon tornatilis* Montfort (=*Voluta tornatilis* Linn.)

cteon bullatus (Gould)

Tornatella bullata Gould, 1847, p. 251.
Actaeon bullatus Tryon & Pilsbry, 1893, p. 163, pl. 49, figs. 10, 11.

Type locality. Off Patagonia.

St. WS 71. 6 miles N 60° E of Cape Pembroke Lt., East Falkland Is., 51° 38′ S, 57° 32′ 30″ W, 23 Feb. 1927, 82–80 m.
St. WS 80. Between Falkland Is. and Patagonia, 50° 57′ S, 63° 37′ 30″ W, 14 Mar. 1927, 152 m.
St. WS 854. Off Patagonia, 45° 16′ S, 64° 25′ W, 22 Mar. 1932, 97 m.
St. WS 856. Off Patagonia, 46° 35′ S, 64° 11′ W, 23 Mar. 1932, 104 m.

cteon antarcticus Thiele

Actaeon antarcticus Thiele, 1912, p. 219, pl. 14, fig. 17.

Type locality. Gauss Station, 380 m. Davis Sea.

St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m.
St. 175. Bransfield Strait, South Shetland Is. 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.

Genus **Neactaeonina** Thiele, 1912

Type (o.d.): *Actaeonina cingulata* Strebel

Neactaeonina cingulata (Strebel)

Actaeonina cingulata Strebel, 1908, p. 8, pl. 2, fig. 17*a–c*.
Neactaeonina cingulata Thiele, 1912, p. 219.

Type locality. South Georgia, 24–52 m.

St. 159. Off South Georgia, 53° 52′ 30″ S, 36° 08′ W, 21 Jan. 1927, 160 m. (one example).
St. 170. Off Cape Bowles, Clarence I., 61° 25′ 30″ S, 53° 46′ W, 23 Feb. 1927, 342 m. (one example).

Dentition. Thiele (1912, loc. cit., text-figs. 4, 5).

Neactaeonina edentula (Watson)

Actaeon edentulus Watson, 1883, p. 284.
Actaeon (*Actaeonina*) *edentulus* Watson, 1886, p. 632, pl. 47, fig. 6.
Neactaeonina edentula Thiele, 1912, p. 219.

Type locality. Balfour Bay, 60 fathoms, Royal Sound, Kerguelen I.

St. 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ 5 Jan. 1927, 155–178 m. (one example).
St. 195. Admiralty Bay, King George I., South Shetland Is., 62° 07′ S, 58° 28′ 30″ W, 30 Mar. 1927, 391 (one example).

Height 25·2 mm.; diameter 12·75 mm. (holotype).
Height 16·5 mm.; diameter 10·5 mm. (St. 144).

Dentition. Unfortunately, the teeth became scattered in the only mount I was able to prepare, bu individually they resemble those figured by Thiele for *cingulata*.

The South Georgian example (St. 144) is slightly more globose than the type, and if this featu should prove to be constant a new species is indicated.

Neactaeonina fragilis Thiele

Neactaeonina fragilis Thiele, 1912, p. 219.
Neactaeonina fragilis Hedley, 1916, p. 63.

Type locality. Gauss Station, Davis Sea.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

Hedley (1916) recorded the species from off Adelie Land, 66° 52′ S, 145° 30′ E in 288 fathoms.

Genus **Toledonia** Dall, 1902

Type (o.d.): *Toledonia perplexa* Dall, 1902, Strait of Magellan = *Odostomiopsis* Thiele in Marte & Thiele, 1903 = *Ohlinia* Strebel, 1905, Type (monotypy): *Admete? limnaeaeformis* Smith

Toledonia limnaeaeformis (Smith)

Admete? limnaeaeformis Smith, 1879, p. 172, pl. 9, fig. 4.
Odostomiopsis typica Martens & Thiele, 1903, p. 68, pl. 7, fig. 27.
Ohlinia limnaeaeformis Strebel, 1905*b*, p. 597, pl. 21, fig. 32 (only).
Toledonia limnaeaeformis Thiele, 1912, p. 249.

Type locality. Kerguelen I. (*limnaeaeformis* and *typica*).

St. WS 88. North of Le Maire Strait, Tierra del Fuego, 54° S, 64° 57′ 30″ W, 6 Apr. 1927, 118 m.

oledonia perplexa Dall

Toledonia perplexa Dall, 1902*b*, p. 513.
Ohlinia limnaeaeformis Strebel, 1905*b*, p. 597, pl. 21, fig. 32*a* (only).

TYPE LOCALITY. East of Punta Arenas, 61 fathoms, Strait of Magellan.

St. 53. Port Stanley, East Falkland Is. on hulk 'Great Britain', 12 May 1926, 0–2 m.

Dall's species was synonymized with *limnaeaeformis* by Thiele (1912), but it seems to be a stable pecies of globose outline and with a very short spire. The St. 53 examples have the same dimensions as *erplexa* (3·2 × 2·3 mm.; aperture 2·2 mm. in height) and correspond to Strebel's (1905, loc. cit. pl. 22) g. 32*a* from Hope Harbour, 6–10 fathoms, Patagonia.

oledonia punctata Thiele

Toledonia punctata Thiele, 1912, p. 249, pl. 14, fig. 23.

TYPE LOCALITY. Observatory Bay, Kerguelen I.

St. 144. Off Mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m.

oledonia globosa Hedley

Toledonia globosa Hedley, 1916, p. 63, pl. 9, fig. 101.

TYPE LOCALITY. Off Mertz Glacier Tongue, 66° 55′ S, 145° 21′ E, 288 fathoms.

St. 1652. Ross Sea, 75° 56·2′ S, 178° 35·5′ W, 23 Jan. 1936. 567 m.
St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

Tomlin (1948, p. 229) recorded this species from 69 metres off Macquarie Island.

oledonia major (Hedley)

Odostomiopsis major Hedley, 1911, p. 6, pl. 1, figs. 9, 10.

TYPE LOCALITY. Cape Royds.

St. 175. Bransfield Strait, South Shetland Is., 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.

One small example, 4·0 × 2·25 mm., but of identical shape and the same style of protoconch as the pe, which measures 6 × 4 mm.

Family PHILINIDAE

Genus Philine Ascanius, 1772

Type: *Philine aperta* Linn.

hiline alata Thiele

Philine alata Thiele, 1912, p. 220, pl. 14, figs. 19, 20.

TYPE LOCALITY. Gauss Station, Davis Sea.

St. 163. Paul Harbour, Signy I., South Orkney Is., 17 Feb. 1927, 18–27 m.
St. 175. Bransfield Strait, South Shetland Is., 63° 17′ 20″ S, 59° 48′ 15″ W, 2 Mar. 1927, 200 m.
St. 187. Neumayr Channel, Palmer Archipelago, 64° 48′ 30″ S, 63° 31′ 30″ W, 18 Mar. 1927, 259 m.
St. 363. 2·5 miles S 80° E of south-east point of Zavodovski I., South Sandwich Is., 26 Feb. 1930, 329–278 m.
St. 1872. Scotia Sea, 63° 29·6′ S, 54° 03·1′ W, 12 Nov. 1936, 247 m.

hiline gibba Strebel

Philine gibba Strebel, 1908, p. 13, pl. 2, fig. 22.

TYPE LOCALITY. South Georgia, 20 m.

St. WS 32. Mouth of Drygalski Fjord, South Georgia, 21 Dec. 1926, 225 m., 329–278 m.

Philine cf. **kerguelensis** Thiele

Philine kerguelensis Thiele, 1925, p. 279 (245), pl. 32, figs. 22, 22*a*.

TYPE LOCALITY. Kerguelen I.

St. WS 219. North-west of Falkland Is., 47° 06′ S, 62° 12′ W, 3 June 1928, 116–114 m.

Height 2·8 mm.; diameter 2·0 mm. (holotype).
Height 6·0 mm.; diameter 4·2 mm. (St. WS 219).

The shells from St. WS 219 seem to represent fully grown examples of Thiele's species, which is rather distinctive with its planorbid spire, finely spirally punctate surface striations and rather deep posterior sinus.

The animal exhibits the usual Philinid characteristics of a large, oblong, head disk without eyes or tentacles, and three large lozenge-shaped calcareous gizzard plates. These plates have a sharply raised cigar-shaped external central area surrounded by a rounded rim; the inner surface is plain and convex. The plates are enormous for the size of the animal, 4 mm. long in an animal with a shell of 6 mm. height.

DENTITION. Fig. M, 95, p. 195. The radula consists of the first lateral only, which is claw-shaped with minute serrations on the concave side. These laterals are very similar in form and detail to those of the genotype. Some species of *Philine* have the addition of up to six marginals.

Philine falklandica n.sp., Pl. VII, fig. 24

Shell small, white, semi-pellucid, ovate-rhomboidal with a very large aperture; outer lip slightly taller than the spire and reaching the sunken inrolled apex by a broadly convex but deeply sinused curve; basal lip broad and flattened. Dorsally there is a slight constriction just below the shoulder. The surface is delicately sculptured with dense, very regular, minutely granulated, axial lirations.

Height 4·9 mm.; diameter 3·9 mm. (holotype).

TYPE LOCALITY. St. WS 219. Between Falkland Is. and Patagonia, 47° 06′ S, 62° 12′ W, 3 June 1928, 116 m.

St. WS 210. North of Falkland Is., 50° 17′ S, 60° 06′ W, 29 May 1928, 161 m.
St. WS 215. North of Falkland Is., 47° 37′ S, 60° 50′ W, 31 May 1928, 219 m.
St. WS 225. Between Falkland Is and Patagonia, 50° 20′ S, 62° 30′ W, 9 June 1928, 162 m.

The distinctive axial sculpture should make this species easily recognizable. The calcareous gizard plates are minute, irregularly oval bodies only 0·4 mm. long in a shell measuring 5·4 × 3·9 mm.

DENTITION. Fig. M, 94, p. 195. There is no central tooth but a massive hooked lateral with minute serrations along the median section of the upper cutting edge and two moderately large marginals shaped like conventional finger-pointers.

Family SCAPHANDRIDAE

Genus **Kaitoa** Marwick, 1931

Type (o.d.): *Kaitoa haroldi* Marwick

Apart from much weaker spiral sculpture the South Georgian species described below has the essential shell characteristics of the New Zealand Miocene *Kaitoa*. The dentition shows that it is not far removed from the Boreal *Bullinella alba* (Brown).

Both genera are cylindrical with an involute spire, but *Kaitoa* resembles *Scaphandra* in having a smooth, concave columella, margined by a deep groove, and *Bullinella* (= *Cylichna*) has a slightly twisted, more or less vertical columella bearing a single oblique plait.

The radula of *Bullinella alba* consists of a small bilobed central tooth with a serrated apical cutting dge, a massive hooked lateral with a median ridge of small denticles and five small hooked smooth arginals. In *Kaitoa scaphandroides* there are only two marginals and none of the teeth bear serrations r denticles. The central varies greatly in form and shows evidence of considerable wear; it is normally omposed of two slightly overlapping convex ridged plates on a rectangular base. The lateral is massive nd robustly hooked and the two marginals are much smaller with long flexed hooks. The laterals in *caphandra* are long, slender and incurved like mammalian ribs.

aitoa scaphandroides n.sp., Pl. X, figs. 69, 70

Shell relatively large, cylindrical, with involute spire, the concave apex callused by an effuse extension f the outer lip. Surface smooth except for axial growth lines and subobsolete, sparse spiral lirations. hell white, covered with a thick, dark, reddish brown epidermis. Outer lip thin, straight and slightly rotractive medially, truncated and broadly open below. Aperture narrow above but considerably xpanded below. Inner lip with a relatively broad callus which becomes thick over the concave columella. here are no plaits, but the columellar callus is bordered by a groove followed by a narrowly arched idge.

Height 19·2 mm.; diameter 8·0 mm. (holotype, St. 30).
Height 23·0 mm.; diameter 9·2 mm. (St. 30).

TYPE LOCALITY. St. 30. West Cumberland Bay, South Georgia, 2·8 miles S 24° W. of Jason I., 6 Mar. 1926, 251 m.

St. WS 62. Wilson Harbour, South Georgia, 19 Jan. 1927, 26–83 m.

DENTITION. Fig. M, 93, p. 195.

There is a conical ferruginous deposit on the spire of the paratype.

Genus **Cylichnina** Monterosato, 1884

Type (s.d. Cossmann, 1895): *Cylichna strigella* Loven. (=*Bulla umbilicata* Montagu)
Mediterranean

ylichnina georgiana Strebel

Cylichnina georgiana Strebel, 1908, p. 10, pl. 2, fig. 20*a–c*.

TYPE LOCALITY. Cumberland Bay, South Georgia, 252–310 m.

St. 144. Off mouth of Stromness Harbour, South Georgia, from 54° 04′ S, 36° 27′ W to 53° 58′ S, 36° 26′ W, 5 Jan. 1927, 155–178 m.

ylichnina cf. **gelida** (Smith)

Bullinella gelida Smith, 1907, p. 12, pl. 2, fig. 12.
Cylichna gelida Thiele, 1912, p. 220.

TYPE LOCALITY. 'Discovery' Winter Quarters, 130 fathoms, McMurdo Sound.

St. 1660. Ross Sea, 74° 46·4′ S, 178° 23·4′ E, 27 Jan. 1936, 351 m.

One immature example of 5 mm. height; the holotype is recorded as 13 × 7 mm. Thiele (1912) ecorded an example 4 mm. in height from Gauss Station.

Genus **Diaphana** Brown, 1827

Type: *Retusa minuta* Brown

Diaphana paessleri (Strebel)

Retusa paessleri Strebel, 1905*b*, p. 577, pl. 22, figs. 34, 34*a*.

TYPE LOCALITY. Patagonia.

St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 115 m.

Family APLUSTRIDAE

Genus **Parvaplustrum** n.g.

Type: *Parvaplustrum tenerum* n.sp.

A minute, white, extremely fragile, *Haminea*-like shell occurred abundantly at depths between 100 and 320 m. in fourteen dredgings, mostly north and north-west of the Falklands.

It is a tectibranch of uncertain affinity, but probably lies nearest to Aplustridae. There are four cephalic tentacles, the outer two with a dorsal groove, rendering them almost auriculate, the inner two simple, no apparent eyes, a prominent bilobed proboscis and two protective shields to the head, the upper one formed by the mantle and its lower counterpart by a widening of the foot, which posteriorly tapers to a broadly V-shaped tail. The stomach plates are numerous, small, cartilaginous, more or less diamond-shaped bodies, which are closely grouped like paving stones (Fig. M, 98). The radula is a rake-like device composed of long, slender, arcuate rods (laterals), each with a shorter and even more slender forked member set directly underneath it (Fig. M, 96). The form of the gills could not be determined owing to the unsatisfactory preservation of the internal structures. The shell is lightly held along the outer edge of the aperture by a thin reflexion of the mantle, and even when the animal is fully expanded most of the shell is probably exposed. The animal is apparently completely retractive (Fig. M, 97, p. 195).

The presence of four cephalic tentacles suggests relationship with either *Aplustrum* or *Hydatina*, the only other tectibranchs, apart from *Pterygophysis* and the *Aplysiomorpha*, possessing two pairs of cephalic tentacles. The *Aplysiomorpha* have neither head disk nor dorsal shield and *Pteryophysis* has four conspicuous wing-like pleuropodial lobes. The stomach-plates resemble those of *Akera bullata* Mueller (Tryon & Pilsbry, 1893) but the radula is not comparable with that of any tectibranch known to me.

Not only a new genus but probably a new family is represented by this anomalous species, but I hesitate to erect a new family without recourse to better preserved material.

Parvaplustrum tenerum n.sp., Pl. VII, fig. 25

Shell minute, pure white, thin and extremely fragile. Ovate-globose. Body-whorl occupying full height of the shell. Aperture wide below, but somewhat constricted above. Spire a shallow cavity occupied by a low, convex, smooth protoconch of one translucent whorl. Outer lip thin, retracted to form a moderately deep sinus with a narrowly rounded termination; basal lip broadly arcuate. Sculpture consisting of extremely fine and dense spiral striations.

Height 2·8 mm.; diameter 2·15 mm. (shell of holotype, St. WS 219).

TYPE LOCALITY. St. WS 219. North-west of Falkland Is., 47° 06′ S, 62° 12′ W, 3 June 1928, 116–114 m.

St. 51. Off Eddystone Rock, East Falkland Is., from 7 miles N 50° E to 7·6 miles N 63° E of Eddystone Rock, 4 May 1926, 105–115 m.
St. WS 210. North of Falkland Is., 50° 17′ S, 60° 06′ W, 29 May 1928, 161 m.
St. WS 211. North of Falkland Is., 50° 17′ S, 60° 06′ W, 29 May 1928, 161–174 m.
St. WS 213. North of Falkland Is., 49° 22′ S, 60° 10′ W, 30 May 1928, 249–239 m.
St. WS 214. North of Falkland Is., 48° 25′ S, 60° 40′ W, 31 May 1928, 208–219 m.
St. WS 216. North of Falkland Is., 47° 37′ S, 60° 50′ W, 1 June 1928, 219–133 m.
St. WS 220. North-west of Falkland Is., 47° 56′ S, 62° 38′ W, 3 June 1928, 108–104 m.
St. WS 227. North-east of Falkland Is., 51° 08′ S, 56° 50′ W, 12 June 1928, 320–295 m.
St. WS 229. North-east of Falkland Is., 50° 35′ S, 57° 20′ W, 1 July 1928, 210–271 m.
St. WS 234. North of Falkland Is., 48° 52′ S, 60° 25′ W, 5 July 1928, 195–207 m.
St. WS 235. North of Falkland Is., 47° 56′ S, 61° 10′ W, 6 July 1928, 155–155 m.

St. WS 236. North of Falkland Is., 46° 55′ S, 60° 40′ W, 6 July 1928, 272–300 m.
St. WS 239. North-west of Falkland Is., 51° 10′ S, 62° 10′ W, 15 July 1928, 196–192 m.

DENTITION. Fig. M, 96, p. 195.

Family SIPHONARIIDAE

Genus **Kergulenella** Powell, 1946

n.nom. for *Kerguelenia* Rochebrune & Mabille, 1887 *non* Stebbing, 1888 (Crustacea)

Type: *Siphonaria lateralis* Gould, 1846

Kerguelenella lateralis (Gould)

Siphonaria lateralis Gould, 1846, p. 153.
Siphonaria redimiculum Reeve, 1856, pl. 5, fig. 24.
Siphonaria magellanica Philippi, 1857, p. 165.
Siphonaria lateralis Rochebrune & Mabille, 1889, p. 29.
Siphonaria lateralis Strebel, 1907, p. 172, pl. 3, figs. 27–29*a*.
Siphonaria (*Liriola*) *lateralis* Thiele, 1912, p. 250.
Siphonaria (*Kerguelenia*) *lateralis* Hubendick, 1946, p. 26, pl. 1, figs. 22–25.

TYPE LOCALITY. Burnt I., Orange Harbour, Strait of Magellan.

St. MS 70. Maiviken, west Cumberland Bay, South Georgia, 9 Mar. 1926, shore coll.

The 'Discovery' South Georgian specimens have low rounded ribs and are exactly as in Hubendick's gures of material from this same location. Topotypes, however, agree with Strebel's figures in having harply raised radial ribs.

Hubendick has synonymized with *lateralis* my *macquariensis* (Powell, 1939, p. 238) from Macquarie sland. It is certainly nearer to South Georgian examples than to Tierra del Fuegan topotypes, but ppears to differ from both in being constantly more elongate. Unfortunately no animals are available or study.

RANGE. Patagonia, Strait of Magellan, Falkland Is., South Georgia (Hubendick, 1946) and possibly Kerguelen I. Hubendick's Auckland, Campbell and Antipodes I. records refer to undescribed species nd the Tasmanian record is most unlikely. An example from St. WS 123. Gough I., is too immature or exact determination.

Genus *Pachysiphonaria* Hubendick, 1945

Type (o.d.): *Siphonaria lessoni* Blainville

Pachysiphonaria lessoni (Blainville)

Siphonaria lessoni Blainville, 1824, p. 49.
Siphonaria lessoni Rochebrune & Mabille, 1889, p. 28.
Siphonaria (*Pachysiphonaria*) *lessoni* Hubendick, 1946, p. 26, pl. 1, figs 1–3.

TYPE LOCALITY. Falkland Is.

St. 54. Port Stanley, Falkland Is., 15 May 1926, shore coll.
Falkland Is. (A.W.B.P. coll. Auck. Mus.).
Comodoro Rividavia, Patagonia (A.W.B.P. coll. Auck. Mus.)

RANGE. West coast of South America below 12° S, Strait of Magellan, Graham Land, Patagonia, Argentina, Uruguay and Falkland Is. (Hubendick, 1946). Hubendick also adds with a query Kerguelen Island and Port Alfred, South Africa.

AMPHINEURA

Family LEPIDOCHITONIDAE

Genus **Icoplax** Thiele, 1892

Type (monotypy): *Chiton puniceus* Couthouy

Icoplax punicea (Gould)

Chiton puniceus Gould, 1846, p. 143.
Chiton illuminatus Reeve, 1847, pl. 22, fig. 147.
Callochiton illuminatus Melvill & Standen, 1914, p. 113.

Type localities. Orange Harbour, Patagonia (*puniceus*); Strait of Magellan (*illuminatus*).

St. WS 834. Off Bahia Grande, Patagonia, 52° 57′ 45″ S, 68° 08′ 15″ W, 2 Feb. 1932, 27–38 m.

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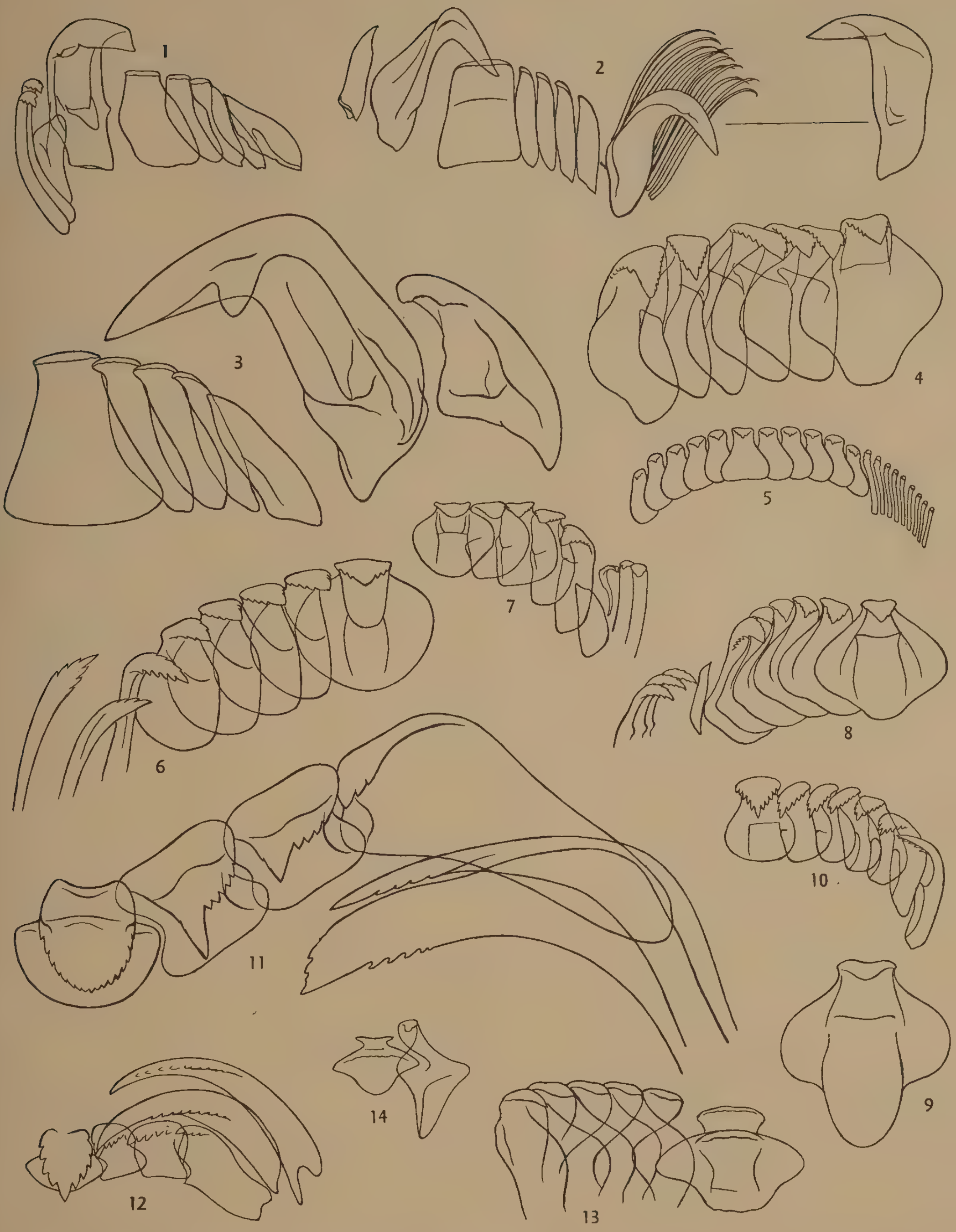


G. Dentition of Fissurellidae, Trochidae and Turbinidae. (1) *Puncturella noachina* Linn., Greenland (Troschel & Thiele, 1891, pl. 27, fig. 2). (2) *Puncturella conica* (d'Orbigny), South Georgia, St. 27. (3) *Parmaphorella melvilli* (Thiele), Falkland Is., St WS 825. (4) *Margarella* (*Promargarita*) *tropidophoroides* (Strebel), South Georgia (Thiele, 1912, pl. 15, fig. 17). (5) *Antimargarita dulcis* (Smith), McMurdo Sound (Eales, 1923, fig. 4). (6) *Tropidomarga biangulata* n.g. and n.sp., South Georgia, St. 159. (7) '*Margarita striata*' = *Pupillaria cinerea* Couthouy, Greenland (Troschel & Thiele, 1891, pl. 25, fig. 9). (8) *Margarella bouvetia* n.sp., Bouvet I. (9) *Margarella antarctica* (Lamy), South Orkneys, St. 164. (10) *Submargarita impervia* Strebel, South Georgia (Thiele, 1912, pl. 15, fig. 18). (11) *Solariella kempi* n.sp., Falkland Is., St. WS 766. (12) *Solariella biradiatula* Martens, Dar-es-Salam (Martens & Thiele, 1903, pl. 8, fig. 37). (13) *Leptocollonia thielei* n.g. and n.sp., South Georgia, St. 156. (14) *Homalopoma carpenteri* Pilsbry, California (Pilsbry, 1888, pl. 60, fig. 73).

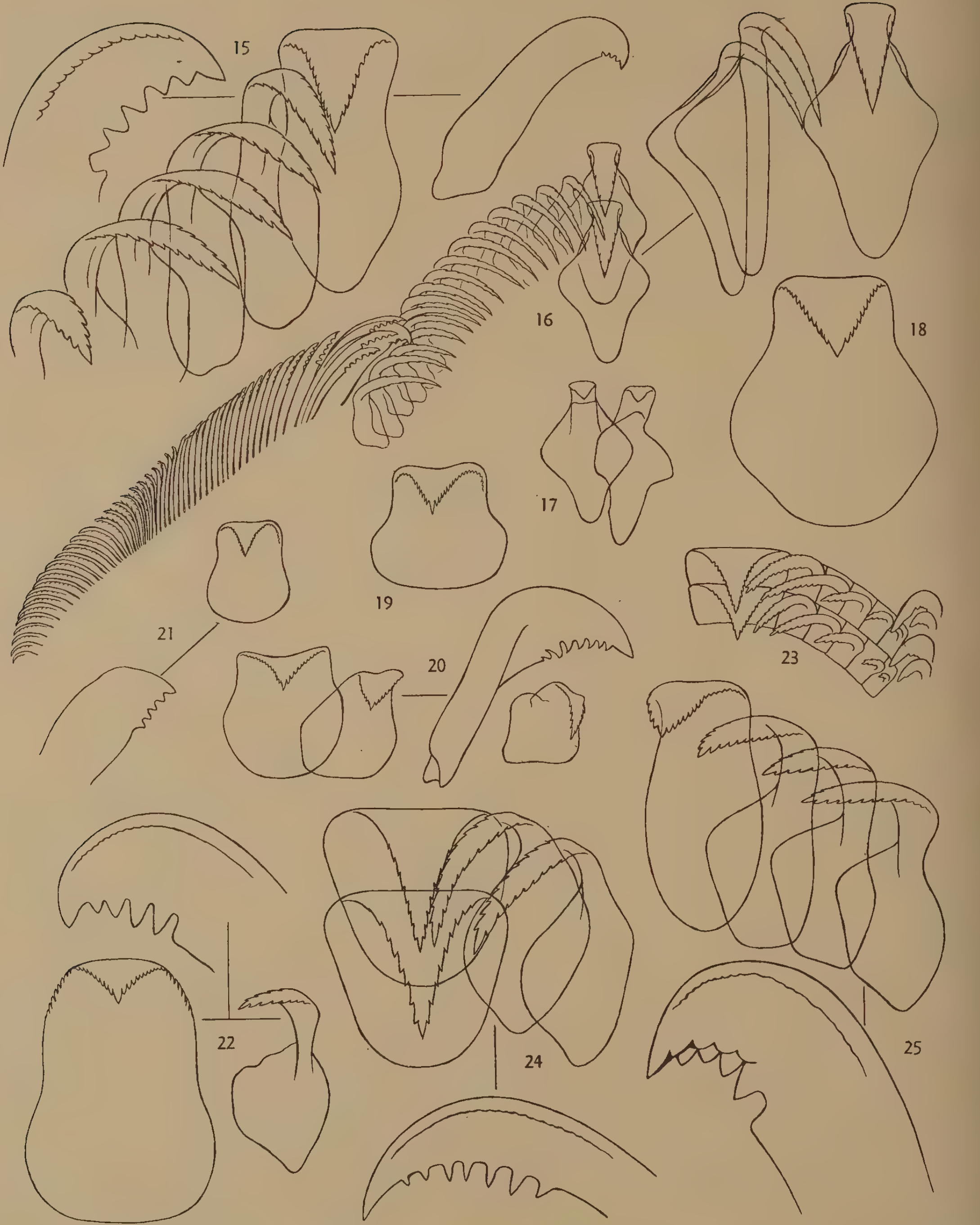
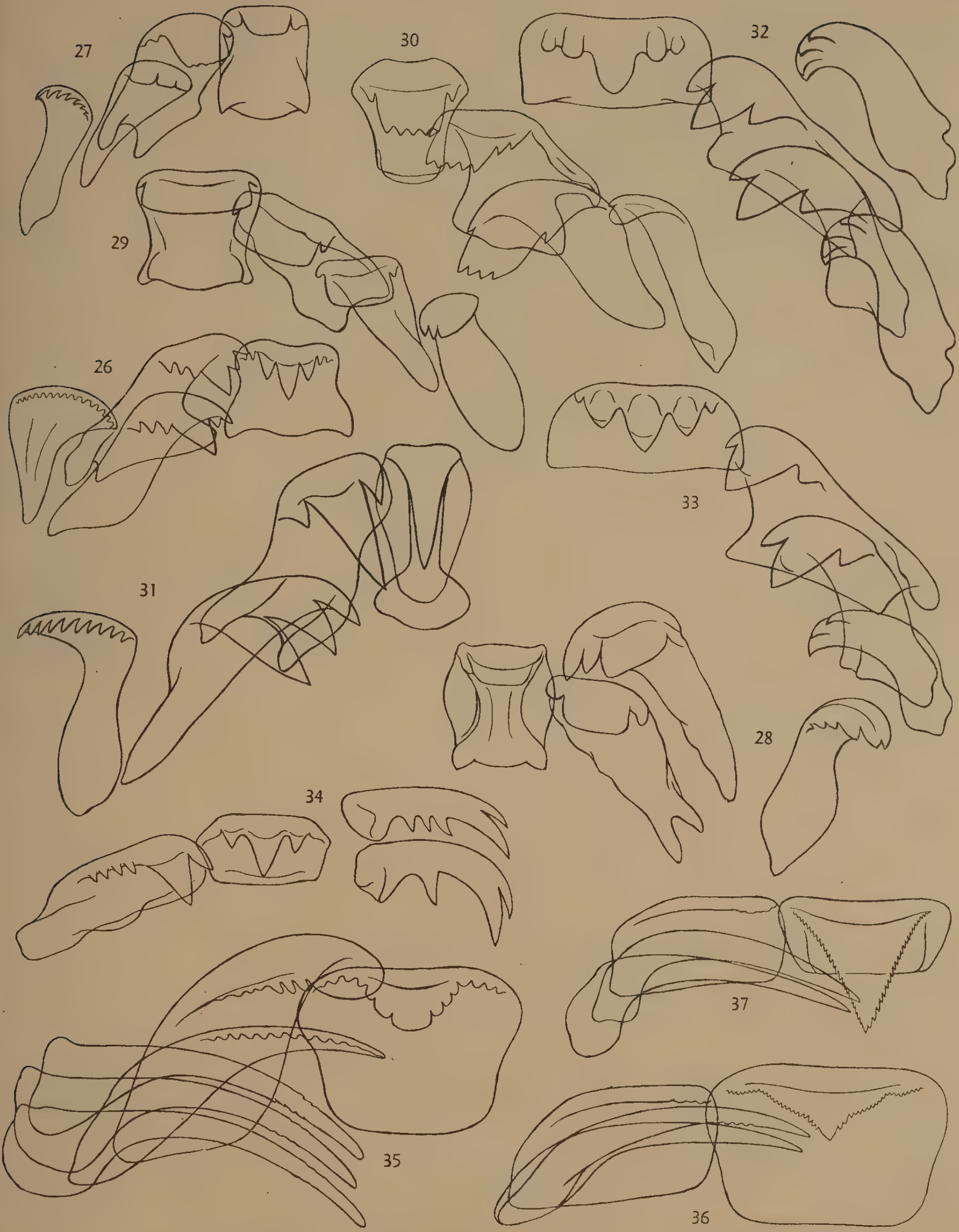


Fig. H. Dentition of Trochidae (Calliostomatinae). (15) *Calliostoma modestulum* Strebel, Falkland Is., St. WS 80. (16) *Venusta trochus georgianus* n.g. and n.sp., South Georgia, St. 42. (17) *Livonia pica* Linn., West Indies (Thiele, 1924, fig. 11 (18) *Calliostoma coppingeri* (Smith), Falkland Is., St WS. 852. (19) *Calliostoma granulatus* Born., Mediterranean (Trosche & Thiele, 1879, pl. 24, fig. 18). (20) *Calliostoma sublaevis chuni* Martens, off Somaliland (Martens & Thiele, 1903, pl. fig. 42). (21) *Calliostoma conulus* Linn., Messina (Troschel & Thiele, 1879, pl. 24, fig. 16). (22) *Calliostoma nordenskjol* Strebel, Patagonia, St. WS. 776. (23) *Falsimargarita gemma* (Smith), off Oates Land (Eales, 1923, fig. 6). (24) *Photinul coerulescens* (King & Broderip), Falkland Is., St. WS 869. (25) *Photinastoma taeniata* (Wood), Falkland Is., St. 56.



g. I. Dentition of Littorinidae, Cerithiidae and Struthiolariidae. (26) *Laevilitorina caliginosa* (Gould), South Georgia St. MS 70. (27) *Laevilitorina* (*Corneolitorina*) *coriacea* Melvill & Standen, South Orkneys, St. 166. (28) *Laevilacunaria antarctica* (Martens), South Georgia (Martens & Pfeffer, 1886, pl. 3, fig. 13). (29) *Laevilacunaria* n.g. *bransfieldensis* (Preston), South Shetland Is., St. 1486. (30) *Laevilacunaria* (*Pellilacunella*) *bennetti* (Preston), Palmer Archipelago, St. 179. (31) *Macquariella aucklandica* Powell, New Zealand. (32) *Pellilitorina setosa* (Smith), South Georgia, St. MS. 71. (33) *Pellilitorina pellita* (Martens), South Orkney Is., St. 164. (34) *Ataxocerithium pullum* (Philippi), Falkland Is., St. WS. 225. (35) *Perissodonta georgiana* Strebel, South Georgia, St. WS 62. (36) *Struthiolaria papulosa* (Martyn), New Zealand. (37) *Pelicaria vermis* (Martyn), New Zealand.

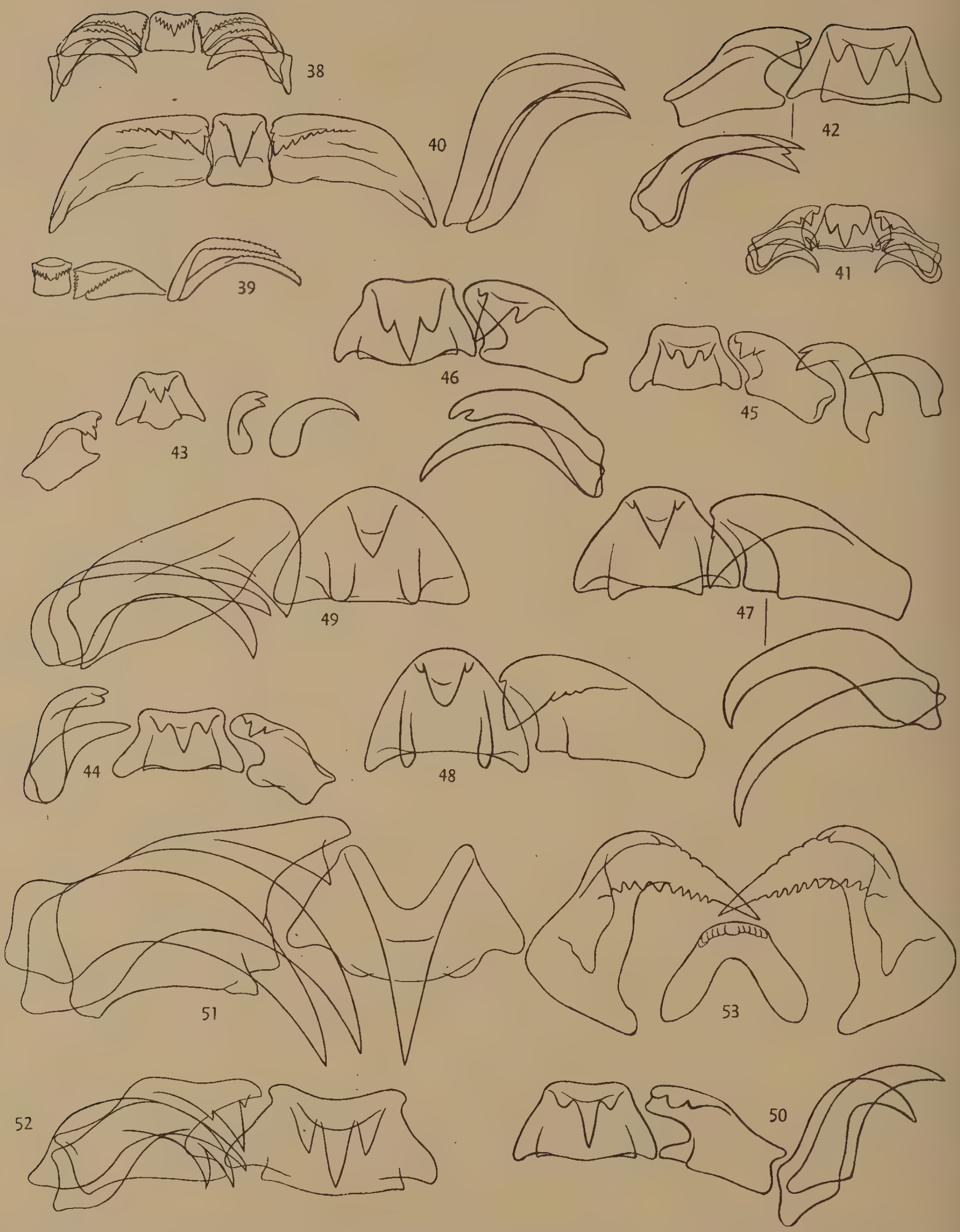
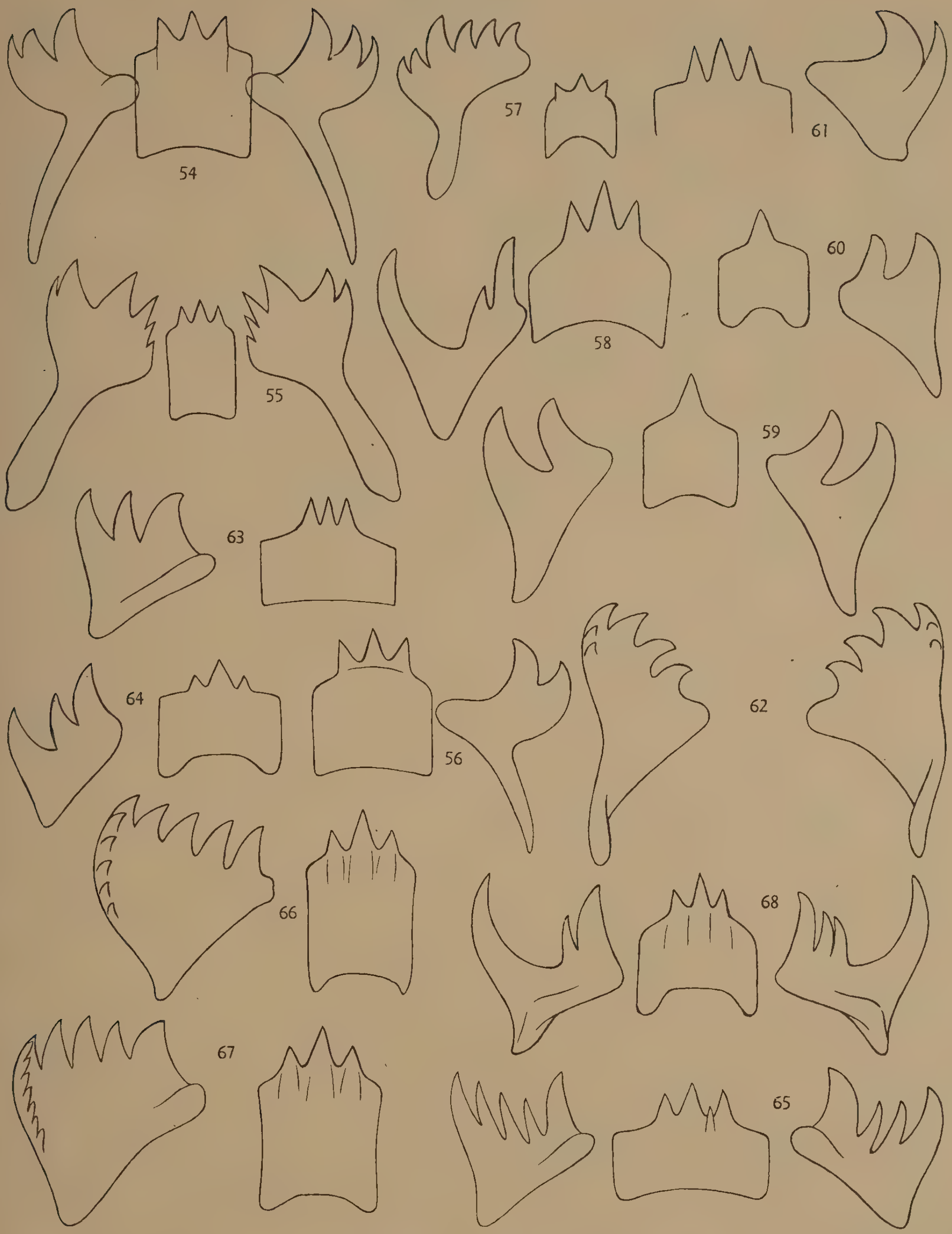


Fig. J. Dentition of Calyptraeidae and Naticidae. (38) *Calyptraea sinensis* (Linn.) (Troschel, 1861, pl. 13, fig. 7 (39) *Sigapatella terraenovae* Peile (Peile, 1924, fig. 1). (40) *Trochita trochiformis* (Gmelin), Falkland Is., St. WS 9 (41) *Amauropsis helicoides* (Johnson) (Troschel, 1861, pl. 15. fig. 6). (42) *Amauropsis aureolutea.*(Strebel), South Georgi St. WS 177. (43) *Amauropsis rossiana* Smith, McMurdo Sound (Eales, 1923, figs. 20–22). (44) *Amauropsis andersso* (Strebel), South Georgia, St. MS 68. (45) *Amauropsis* (*Kerguelenatica*) *grisea* (Martens), Kerguelen I. (Martens & Thiel 1903, pl. 8, fig. 44). (46) *Tectonatica impervia* (Philippi), South Georgia, St. 159. (47) *Falsilunatia soluta* (Gould), Falklan Is., St. WS 808. (48) *Falsilunatia recognita* (Rochebrune & Mabille), Falkland Is., St. WS 766. (49) *Globisinu venustum* (Suter), New Zealand. (50) *Sinuber sculpta scotiana* n.subsp., South Orkney Is., St. 167. (51) *Tanea zelandic* (Quoy & Gaimard), New Zealand. (52) *Notocochlis migratoria* (Powell), Australia. (53) *Lamellaria* sp., Falkland Is St. WS 867.



ig. K. Dentition of Buccinacea. (54) *Prosipho madigani* Hedley, Palmer Archipelago, St. 182. (55, *Prosipho chordatus* (Strebel), South Georgia, St. 123. (56) *Prosipho astrolabiensis* (Strebel), South Georgia, St. 140. (57) *Anomacme smithi* Strebel (Thiele, 1912, pl. 16, fig. 14). (58) *Glypteuthria meridionalis* (Smith) (Thiele, 1912, pl. 16, fig. 17). (59) *Falsimohnia albozonata* (Watson), South Georgia, St. 140. (60) *Lachesis australis* Martens = *F. albozonata* Martens & Thiele, Kerguelen I. (Martens & Thiele, 1903, pl. 9, fig. 55). (61) *Notoficula problematica* n.sp., Falkland Is., St. WS 766. (62) *Meteuthria martensi* (Strebel) (Thiele, 1912, pl. 16, fig. 18). (63) *Probuccinum delicatulum* n.sp., South Georgia, St. 140. (64) *Probuccinum 'tenerum'* Thiele (Thiele, 1912, pl. 16, fig. 21). (65) *Probuccinum angulatum* n.sp., South Georgia, St. 156. (66) *Proneptunea duplicarinata* n.sp., South Georgia, St. 160. (67) *Proneptunea fenestrata* n.sp., South Georgia, St. 141 (68) *Cavineptunea monstrosa* n.g. and n.sp., South Georgia, St. 159.

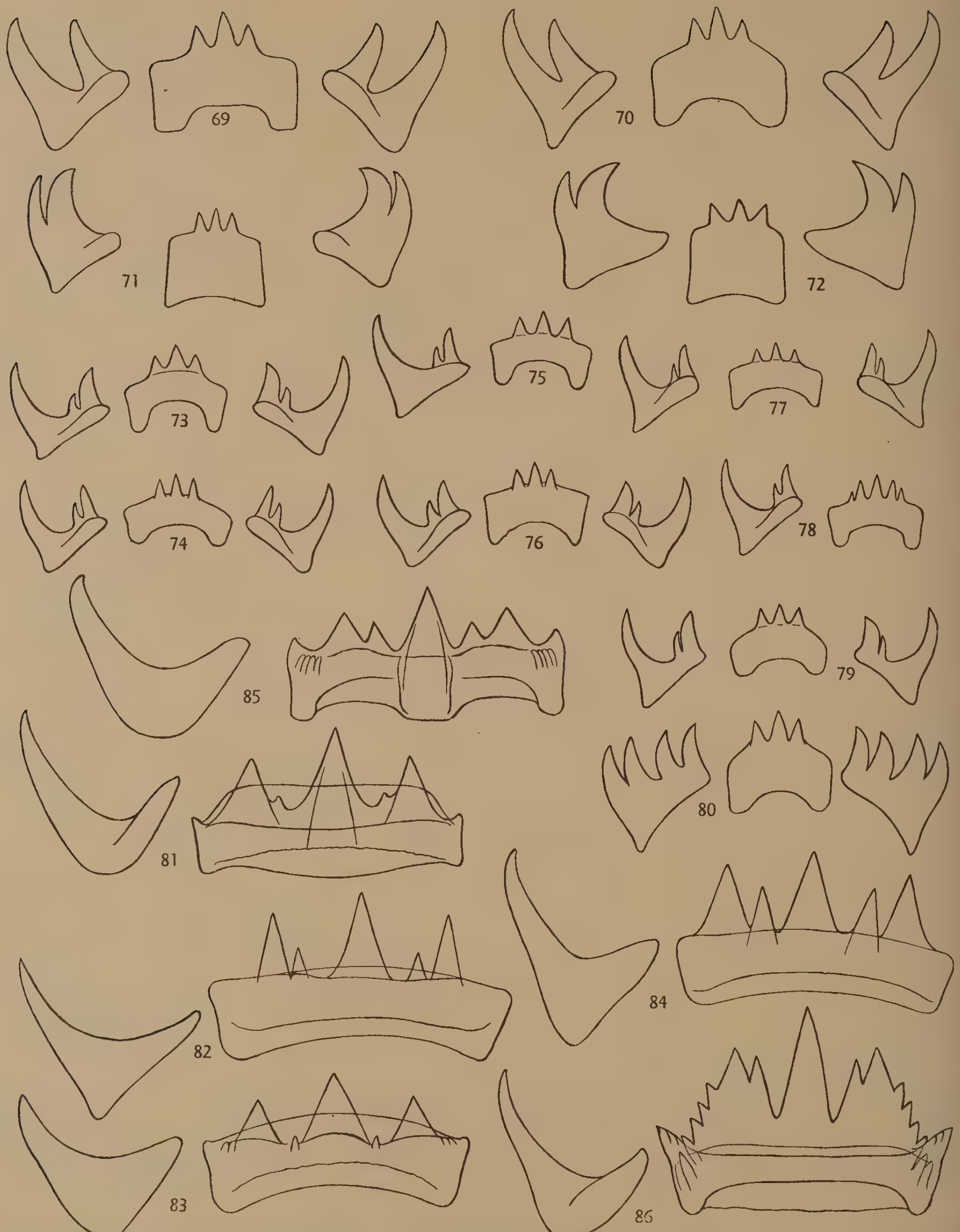


Fig. L. Dentition of Buccinacea and Muricidae. (69) *Pareuthria fuscata* (Brug.), Falkland Is., St. 56. (70) *Pareuthria veni* *tula* n.sp., Cape Horn—Staten I., St. 388. (71) *Tromina tricarinata* n.sp., Clarence I., St. 170. (72) *Tromina bella* n.s Falkland Is., St. WS 818. (73) *Chlanidota pilosa* n.sp., Bouvet I., St. 456. (74) *Chlanidota signeyana* n.sp., South Orkn Is., St. 167. (75) *Chlanidota densesculpta* (Martens), South Georgia, St. MS 10. (76) *Chlanidota elongata* (Lamy), Sou Shetland Is., St. 1952. (77) *Chlanidota paucispiralis* n.sp., South Georgia, St. 159. (78) *Pfefferia elata* Strebel, Sou Georgia, St. 30. (79) *Pfefferia cingulata* Strebel, South Georgia, St. 146. (80) *Chlanidotella modesta* (Martens), Sou Georgia, St. MS. 10. (81) *Trophon geversianus* (Pallas), off Patagonia, St. WS 847. (82) *Trophon shackletoni paucilamella* n.subsp., South Georgia, St. 144. (83) *Trophon echinolamellatus* n.sp., Clarence I., St. 170. (84) *Trophon ohlini* Streb Falkland Is., St. WS 80. (85) *Trophon* (*Fuegotrophon*) *pallidus* (Brod.), Falkland Is., St. 56. (86) *Trophon* (*Stramonitropho* *laciniatus* (Martyn), Falkland Is., St. WS 788.

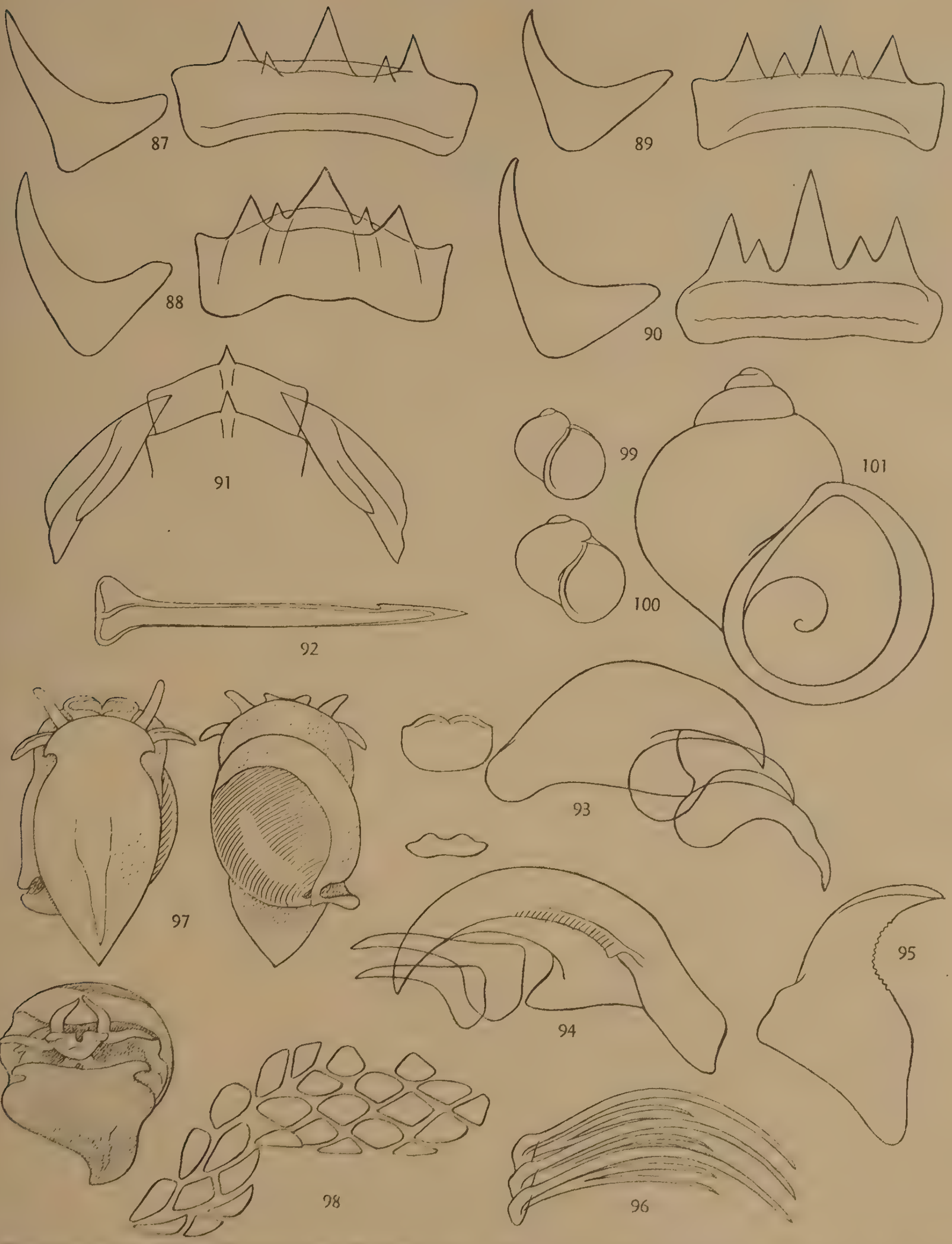


Fig. M. Dentition of Muricidae, Turridae and Tectibranchia. (87) *Trophon distantelamellatus* Strebel, South Georgia, St. MS 67. (88) *Trophon scotianus* n.sp., South Georgia, St. WS 27. (89) *Trophon cuspidarioides* n.sp., South Georgia, St. 42. (90) *Xymenopsis albidus* (Philippi), off Patagonia, St. WS 834. (91) *Aforia magnifica* (Strebel), Palmer Archipelago, St. 182. (92) *Typhlodaphne purissima* (Strebel), South Georgia, St. 159. (93) *Kaitoa scaphandroides* n.sp., South Georgia, St. 30. (94) *Philine falklandica* n.sp., Falkland Is., St. WS 225. (95) *Philine* cf. *kerguelensis* Thiele, Falkland Is., St. WS 219. (96) *Parvaplustrum tenerum* n.sp., Falkland Is., St. WS 219. (97) *Parvaplustrum tenerum* n.sp., ventral, dorsal and frontal views. (98) *Parvaplustrum tenerum* n.sp., stomach plates. (99) *Laevilacunaria* (*Pellilacunaria*) *bennetti* (Preston). Tracing of Preston's figure of holotype (2 × 2 mm.). (100) *Laevilacunaria bennetti*, juvenile (2 × 2 mm.). (101) *Laevilacunaria bennetti*, adult (6 × 5 mm.). Palmer Archipelago, St. 179.

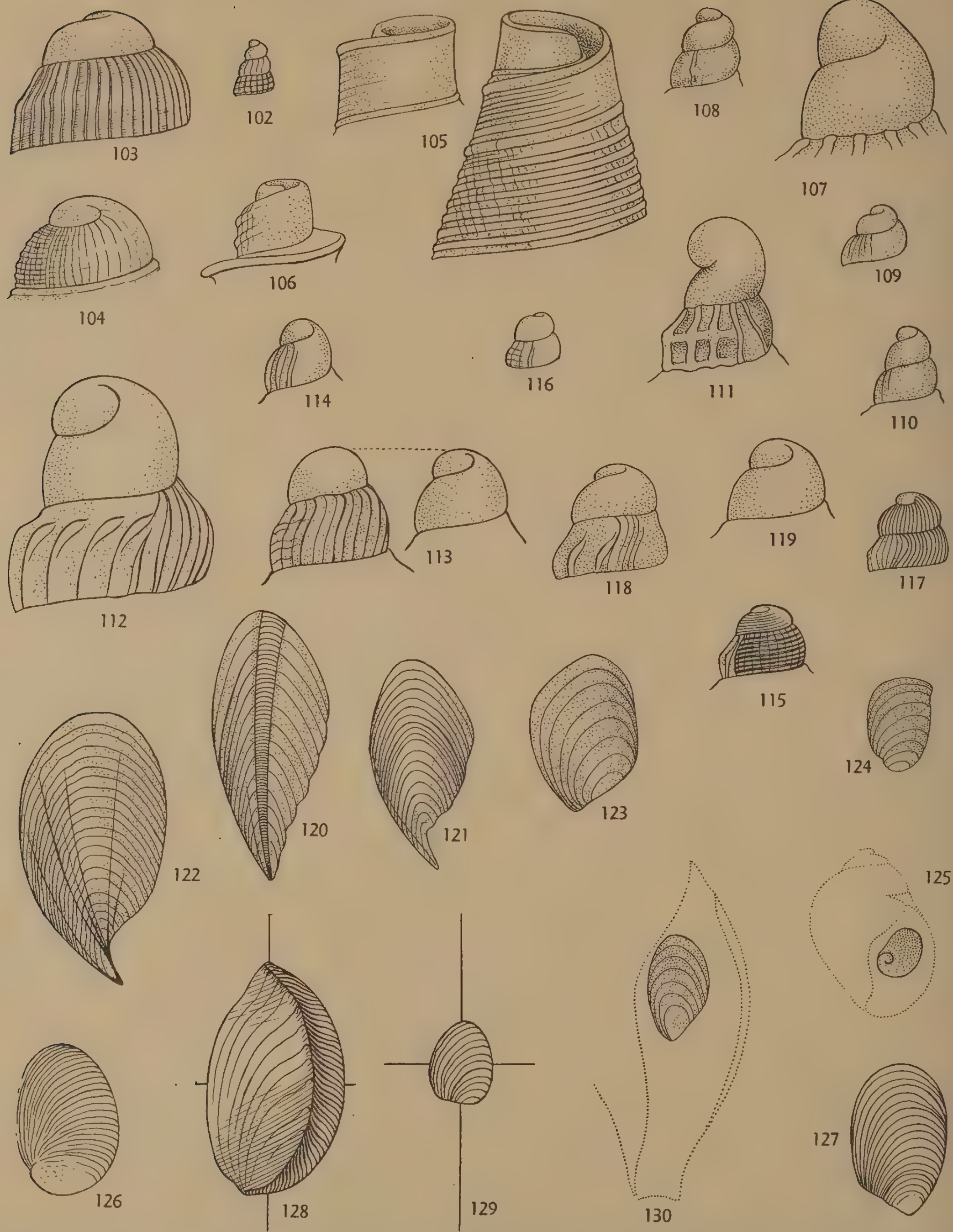


Fig. N. Protoconchs (all to uniform scale). (102) *Ataxocerithium pullum* (Philippi), Falkland Is., St. WS 225. (103) *Tromi*
tricarinata n.sp., Clarence I., St. 170. (104) *Tromina bella* n.sp., Falkland Is., St. WS 817. (105) *Cavineptunea monstro*
n.g. and n.sp., South Georgia, St. 159. (106) *Proneptunea fenestrata* n.sp., South Georgia, St. 140. (107) *Trophon geve*
sianus (Pallas), Falkland Is. (108) *Zeatrophon ambiguus* (Philippi), New Zealand. (109) *Xymene plebejus* (Hutton), Ne
Zealand. (110) *Xymenopsis liratus* (Gould), Falkland Is., St. 52. (111) *Trophon* (*Fuegotrophon*) *pallidus* (Broderip
Staten I., St. WS 88. (112) *Leucosyrinx falklandica* n.sp., Falkland Is., St. WS 781. (113) *Leucosyrinx paragenota* n.sp
Burdwood Bank, St. 652. (114) *Lorabela* n.g. *notophila* (Strebel), South Georgia, St. WS 27. (115) *Belalora thielei* n.g. ar
n.sp., Falkland Is., St. WS 801. (116) *Pleurotomella? ohlini* (Strebel), Falkland Is. (117) *Pleurotomella simillima* (Thiele), Ro
Sea, St. 1660. (118) *Eumetadrillia fuegiensis* (Smith), off Patagonia, St. WS 787. (119) *Typhlodaphne* n.g. *purissima* (Strebe
South Georgia, St. 159. Opercula (Figs. 120, 121, 123–126, 130 all to uniform scale.. Fig. 122 = ⅝, and Fig. 127 = ×
(120) *Perissodonta georgiana* Strebel, South Georgia, St. WS 62. (121) *Pelicaria vermis* (Martyn), New Zealan
(122) *Struthiolaria papulosa* (Martyn), New Zealand. (123) *Probuccinum delicatulum* n.sp., South Georgia, St. 15
(124) *Proneptunea fenestrata* n.sp., South Georgia, St. 140. (125) *Notoficula problematica* n.sp., Falkland Is., St. WS 76
(126) *Tromina tricarinata* n.sp., Clarence I., St. 170. (127) *Falsimohnia albozonata* (Watson), South Georgia, St. 14
(128) *Pfefferia elata* Strebel, South Georgia. (129) *Chlanidota signeyana* n.sp., South Orkney Is. (size relationship betwe
operculum and aperture represented by crossed lines). (130) *Typhlodaphne* n.g. *purissima* (Strebel), South Georgia, St. 15

PLATE V

Fig. 1. *Margarella jason* n.sp., 6 × 4·5 mm. (holotype), St. 45, South Georgia, 238–270 m.

Fig. 2. *Margarella porcellana* n.sp., 8 × 7 mm. (holotype), St. 1562, off Marion I., 97–104 m.

Fig. 3. *Margarella bouvetia* n.sp., 8·4 × 7·5 mm. (holotype), St. 456, off Bouvet I., 40–45 m.

Fig. 4. *Margarella* (*Promargarita*) *tropidophoroides obsoleta* n.subsp., 13·5 × 11 mm. (holotype), St. MS 6, South Georgia, 24–30 m.

Fig. 5. *Tropidomarga biangulata* n.g. and n.sp., 14·6 × 13 mm. (holotype), St. 159, South Georgia, 160 m.

Fig. 6. *Solariella kempi* n.sp., 12 × 11·75 mm. (holotype), St. WS 766, between Falkland Is. and Argentina, 545 m.

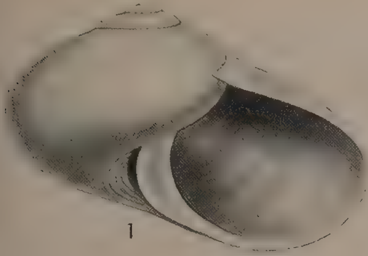
Fig. 7. *Brookula strebeli* n.sp., 1·5 × 1·25 mm. (holotype), St. 144, South Georgia, 155–178 m.

Fig. 8. *Brookula pfefferi* n.sp., 2 × 1·75 mm. (holotype), St. 144, South Georgia, 155–178 m.

Fig. 9. *Leptocollonia thielei* n.sp., 9 × 7·5 mm. (holotype), St. 153, South Georgia, 106 m.

Fig. 10. *Sinuber sculpta scotiana* n.subsp., 9·5 × 8 mm. (holotype), St. 167, South Orkney Is., 244–344 m.

PLATE V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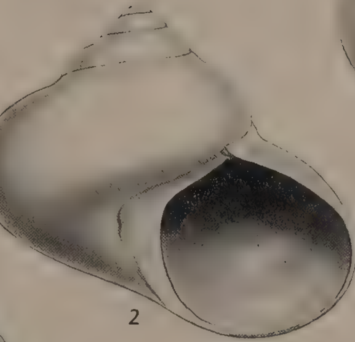
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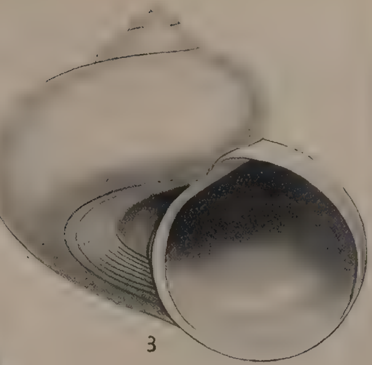
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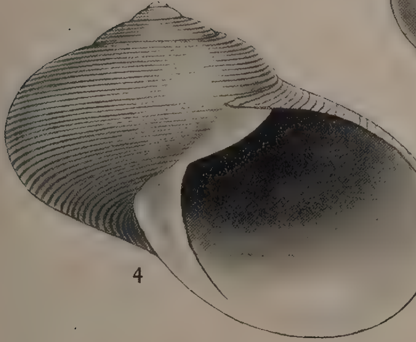
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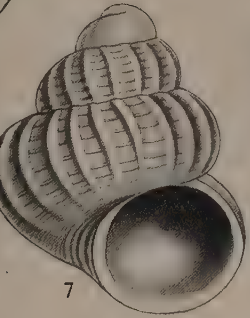
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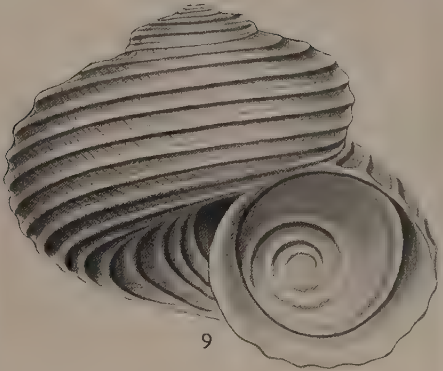
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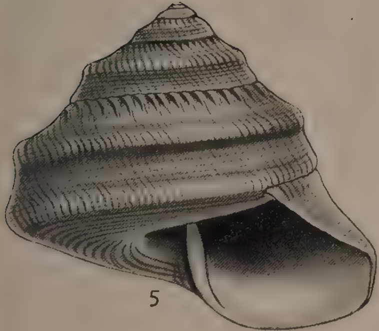
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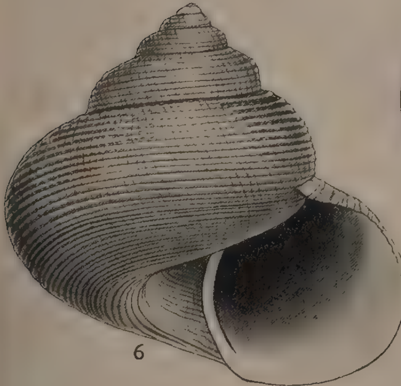
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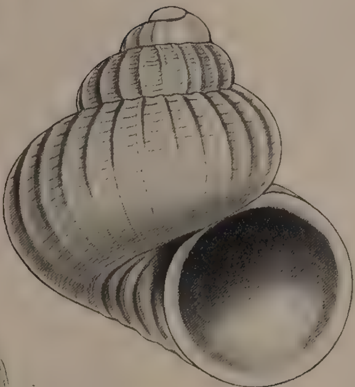
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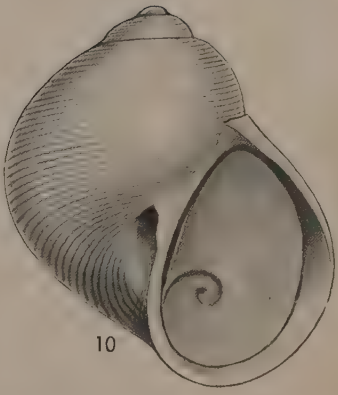
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PLATE VI

Fig. 11. *Prosipho perversus* n.sp., 4 × 2 mm. (holotype), St. 144, South Georgia, 155–178 m.

Fig. 12. *Proneptunea fenestrata* n.sp., 12 × 6·6 mm. (holotype), St. 141, South Georgia, 17–27 m.

Fig. 13. *Proneptunea duplicarinata* n.sp., 17 × 7 mm. (holotype), St. 160, between South Georgia and Shag Rocks, 177 m.

Fig. 14. *Tromina fenestrata* n.sp., 6 × 4 mm. (holotype), St. WS 766, between Falkland Is. and Argentina, 545 m.

Fig. 15. *Tromina simplex* n.sp., 7·25 × 4·25 mm. (holotype), St. WS 237, north of Falkland Is., 150–256 m.

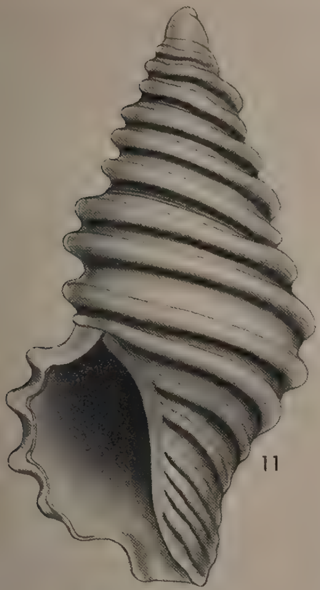
Fig. 16. *Tromina bella* n.sp., 7·4 × 5 mm. (holotype), St. WS 817, between Falkland Is. and Patagonia, 191–202 m.

Fig. 17. *Pareuthria venustula* n.sp., 13·3 × 5·9 mm. (holotype), St. 388, between Cape Horn and Staten I., 121 m.

Fig. 18. *Notoficula problematica* n.sp., 5·25 × 3·6 mm. (holotype), St. WS 766, between Falkland Is. and Argentina, 545 m.

Fig. 19. *Pleurotomella*? *anomalapex* n.sp., 7·8 × 3·9 mm. (holotype), St. WS 225, between Falkland Is. and Patagonia, 162–161 m.

Fig. 20. *Belalora thielei*, n.g. and n.sp., 7·1 × 3·7 mm. (holotype), St. WS 801, north-west of Falkland Is. to Patagonia, 165 m.



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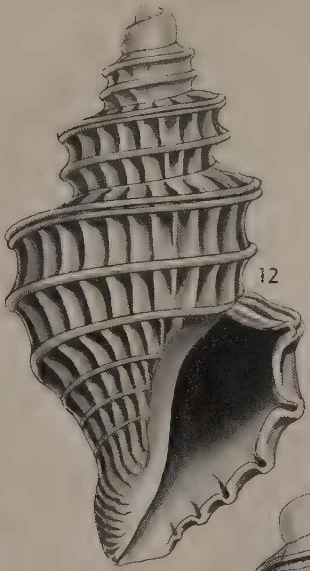

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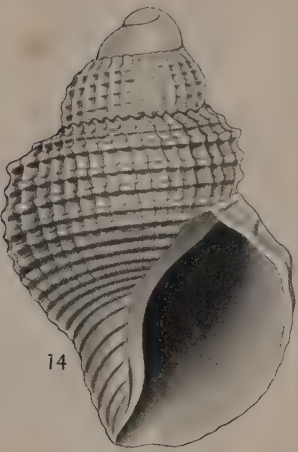

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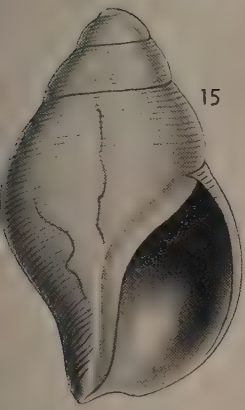

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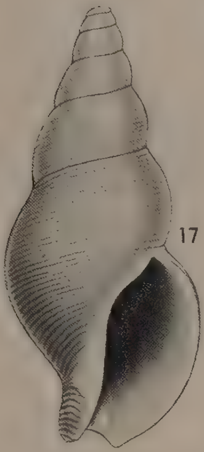

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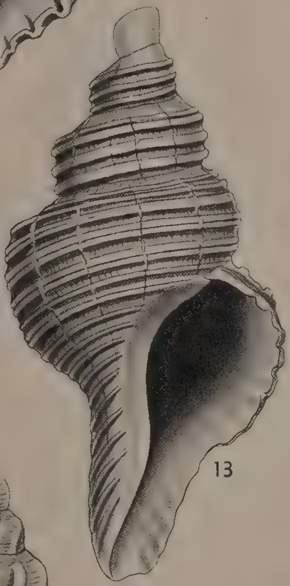

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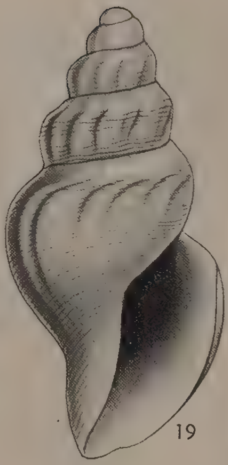

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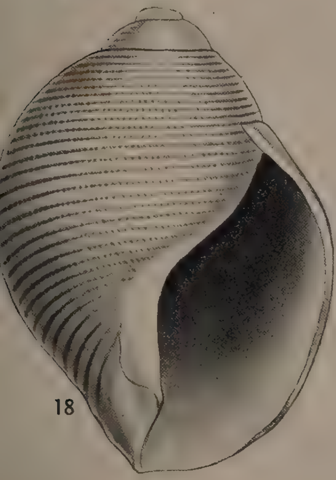

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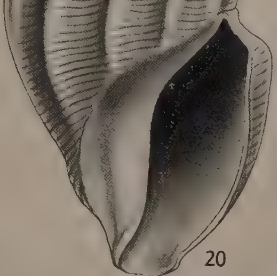

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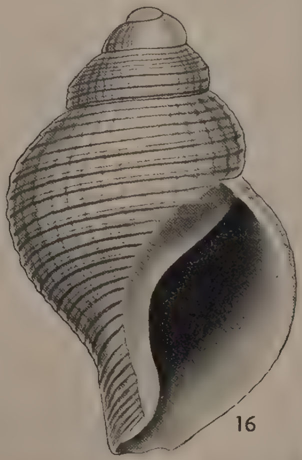

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PLATE VII

Fig. 21. *Discotrichoconcha cornea* n.g. and n.sp., 5·3 × 1·7 mm. (holotype), St. 182, Palmer Archipelago, 278–500 m.

Fig. 22. *Trochita georgiana* n.sp., 12·5 × 7·5 mm. (holotype), St. 160, near Shag Rocks, west of South Georgia, 177 m.

Fig. 23. *Acirsa annectens* n.sp., 11·5 × 4·5 mm. (holotype), St. WS 766, north of Falkland Is., 545 m.

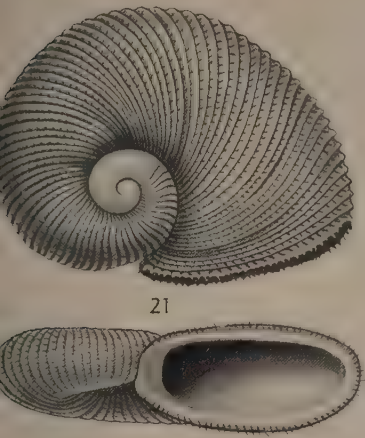
Fig. 24. *Philine falklandica* n.sp., 4·9 × 3·9 mm. (holotype), St. WS 219, between Falkland Is. and Patagonia, 116 m.

Fig. 25. *Parvaplustrum tenerum* n.g. and n.sp., 2·8 × 2·15 mm. (holotype), St. WS 219, between Falkland Is. and Patagonia, 116–114.

Fig. 26. *Turritellopsis thielei* n.sp., 8·5 × 3·8 mm. (holotype), St. 181, Palmer Archipelago, 160–335 m.

Fig. 27. *Probuccinum angulatum* n.sp., 9·9 × 7 mm. (holotype), St. 156, north of South Georgia, 200–236 m.

Fig. 28. *Probuccinum delicatulum* n.sp.,' 20·5 × 10·5 mm. (holotype), St. 140, South Georgia, 122–136 m.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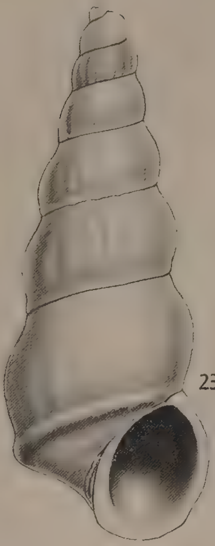
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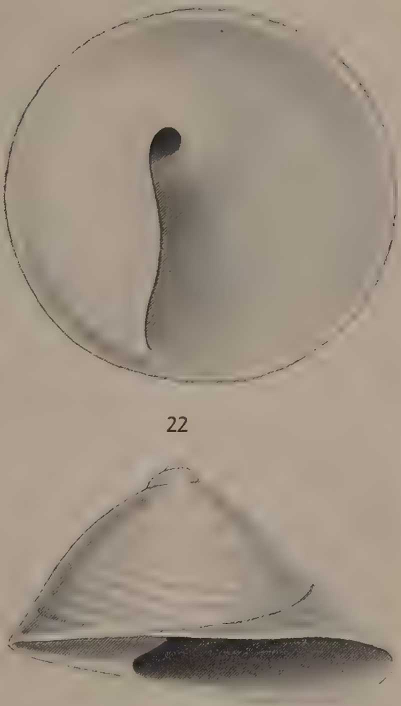
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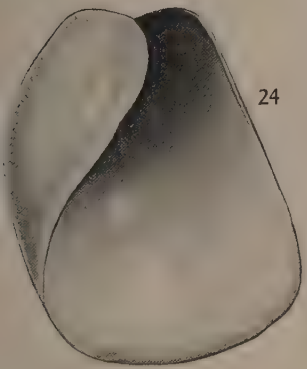
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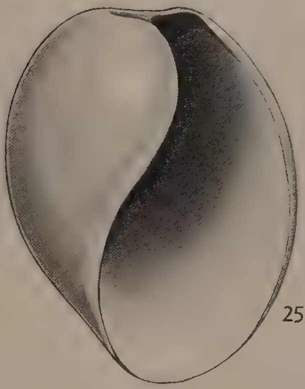
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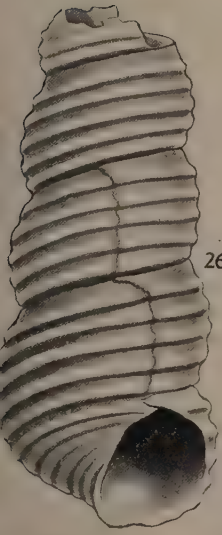
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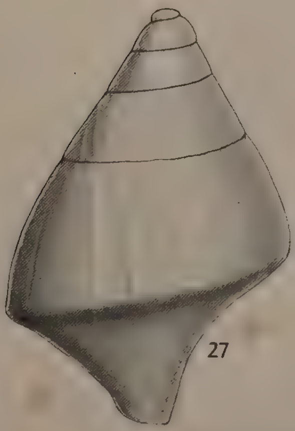
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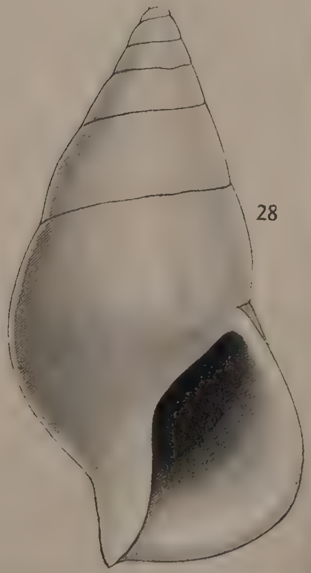
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PLATE VIII

Figs. 29, 30. *Chlanidota pilosa* n.sp., 25·5 × 20 mm. (holotype), St. 456, 1 mile east of Bouvet I., 40–45 m.

Fig. 31. *Chlanidota densesculpta* (Martens, 1885), 30 × 21 mm., St. 1941, South Georgia, 55–22 m.

Fig. 32. *Chlanidota densesculpta* (Martens, 1885), 30 × 18 mm., St. WS 62, South Georgia, 26–83 m.

Fig. 33. *Chlanidota densesculpta* (Martens, 1885), 40 × 23 mm., St. WS 62, South Georgia, 26–83 m.

Fig. 34. *Chlanidota signeyana* n.sp., 38 × 24·5 mm. (holotype), St. 167, Signy I., South Orkney Is., 244–344 m.

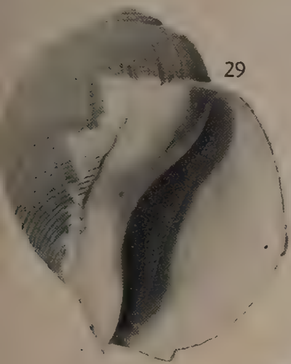
Fig. 35. *Chlanidota signeyana* n.sp., St. 167 (paratype).

Fig. 36. *Chlanidota paucispiralis* n.sp., 22·1 × 13·5 mm. (holotype), St. 159, South Georgia, 160 m.

Fig. 37. *Chlanidota paucispiralis* n.sp., St. 159 (paratype).

Figs. 38, 39. *Cavineptunea monstrosa* n.g. and n.sp., 36 × 18 mm. (holotype), St. 159, South Georgia, 160 m.

Figs. 40–42. *Perissodonta georgiana* Strebel, 1908, St. WS 62, South Georgia, 130 m.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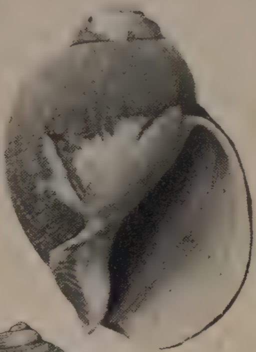
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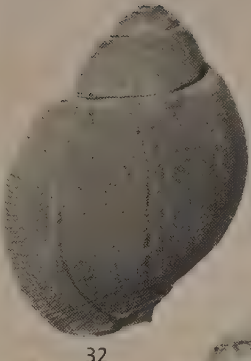
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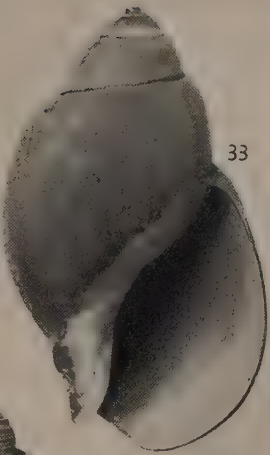
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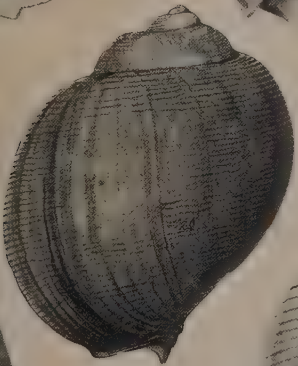
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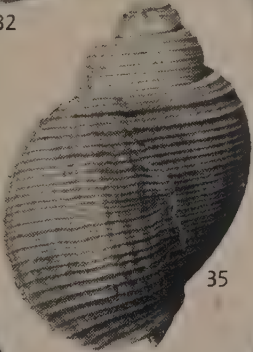
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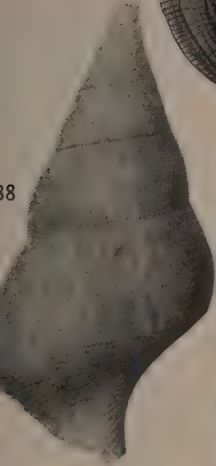
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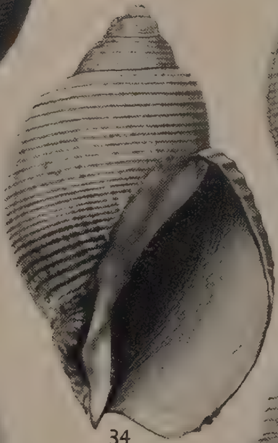
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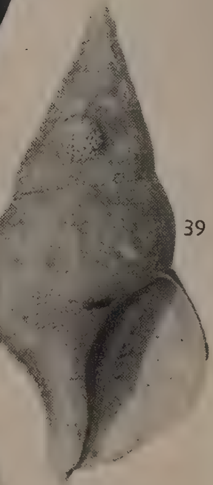
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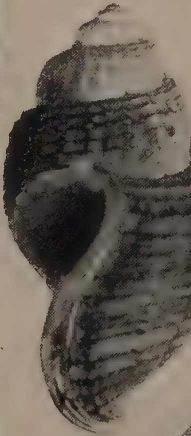
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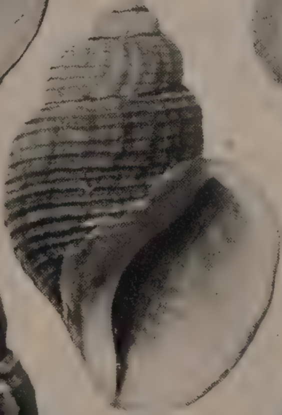
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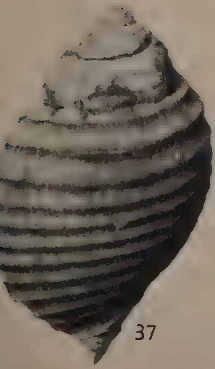
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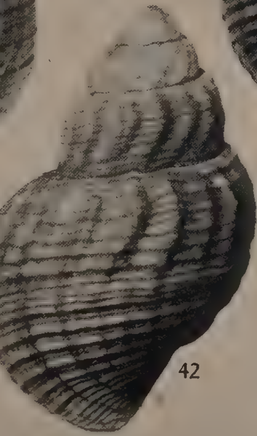
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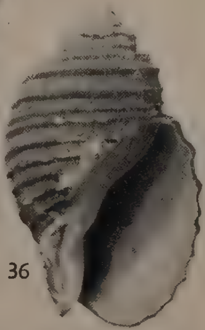
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PLATE IX

Fig. 43. *Miomelon scoresbyana* n.sp., 48·4 × 25·5 mm. (holotype), St. WS 816, between Falkland Is. and Strait of Magellan, 150 m.

Fig. 44. *Trophon echinolamellatus* n.sp., 64 × 39 mm. (paratype), St. 170, Clarence I., 342 m.

Fig. 45. *Trophon echinolamellatus* n.sp., 63 × 35 mm. (holotype), St. 170, Clarence I., 342 m.

Figs. 46, 47. *Xymenopsis falklandicus* (Strebel, 1908) (n.g.), St. 55, Port Stanley, Falkland Is., 10–16 m.

Figs. 48, 49. *Trophon scotianus* n.sp., 34 × 24 mm. (holotype), St. WS 27, South Georgia, 107 m.

Fig. 50. *Trophon cuspidarioides* n.sp., 13 × 5·7 mm. (holotype), St. 42, South Georgia, 120–204 m.

Fig. 51. *Trophon poirieria* n.sp., 15·5 × 8·75 mm. (holotype), St. 190, Palmer Archipelago, 93–130 m.

Fig. 52. *Trophon shackletoni paucilamellatus* n.subsp., 31 × 21 mm. (holotype), St. 148, South Georgia, 132–148 m.

Fig. 53. *Typhlodaphne strebeli* n.sp., 20 × 7·25 mm. (holotype), St. 388, between Cape Horn and Staten I., 121 m.

Fig. 54. *Leucosyrinx paratenoceras* n.sp., 38·75 × 11·5 mm. (holotype), St. 1952, South Shetland Is., 367–382 m.

Fig. 55. *Leucosyrinx falklandica* n.sp., 15·75 × 5·8 mm. (holotype), St. WS 781, north of Falkland Is., 336–341 m.

Fig. 56. *Leucosyrinx paragenota* n.sp., 21·25 × 7·5 mm. (holotype), St. 652, Burdwood Bank, 171–169 m.

Fig. 57. *Paradmete percarinata* n.sp., 16·5 × 10·5 mm. (holotype), St. 1957, Clarence I., South Shetland Is., 785–810 m.

PLATE IX

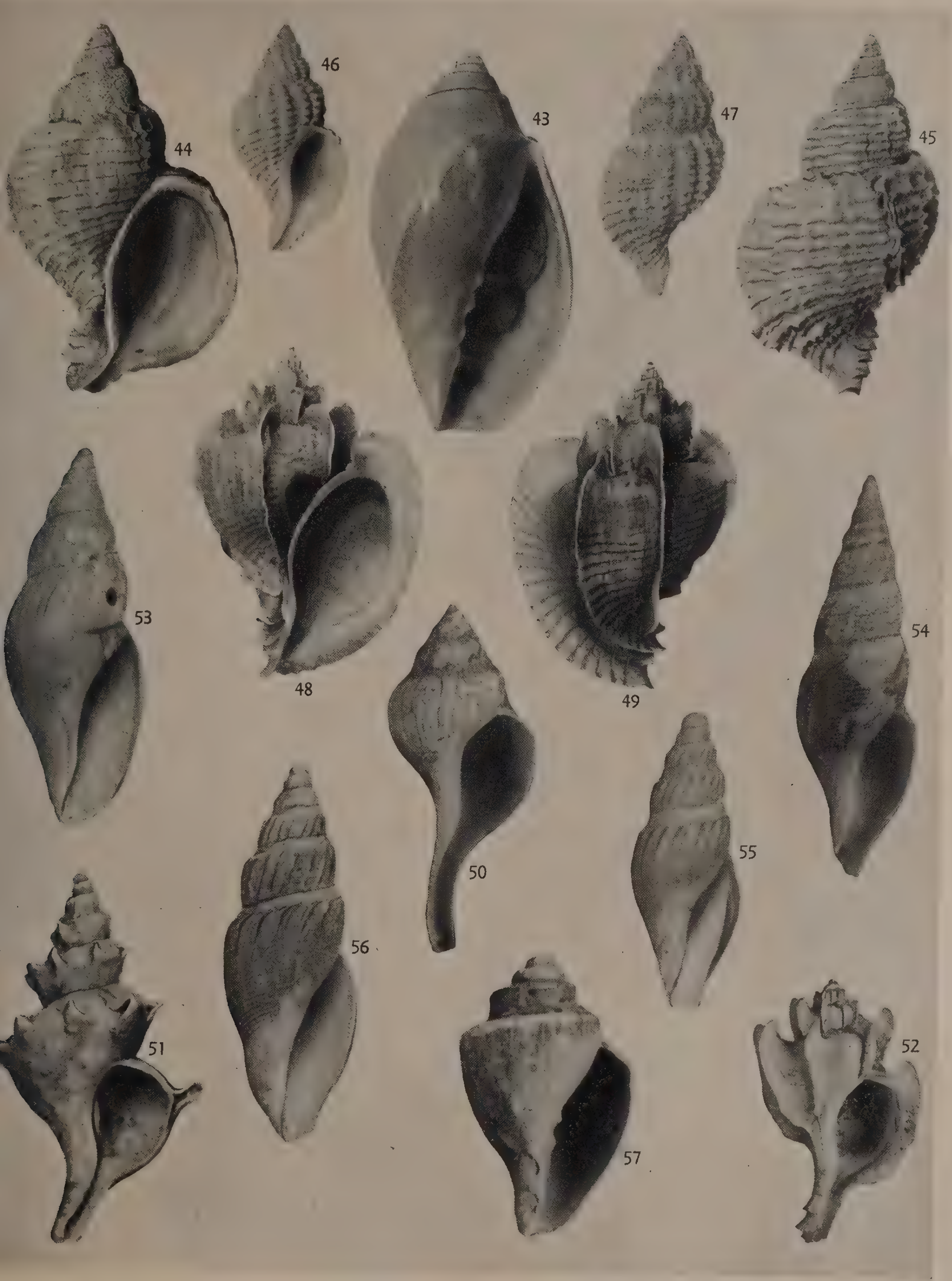
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PLATE X

Figs. 58, 59. *Amauropsis anderssoni* (Strebel, 1907), St. WS 62. Wilson Harbour, South Georgia, 26–83 m.

Fig. 60. *Amauropsis* (*Kerguelenatica*) *grisea* (Martens, 1878) (n.subg.), Royal Sound, Kerguelen I. (British Museum).

Fig. 61. *Falsilunatia falklandica* (Preston, 1913) (n.g.) Port Stanley, Falkland Is. (paratype, British Museum).

Fig. 62. *Tectonatica impervia* (Philippi, 1845), Falkland Is. (British Museum).

Fig. 63. *Admete consobrina* n.sp., 9·75 × 6·6 mm. (holotype), St. 159, north of South Georgia, 160 m.

Figs. 64, 65. *Tromina tricarinata* n.sp., 13·5 × 8·5 mm. (holotype), St. 170, Clarence Is., 342 m.

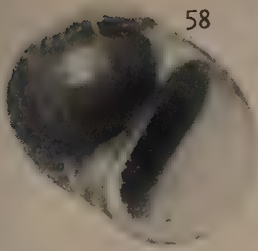
Fig. 66. *Marginella dozei* Rochebrune and Mabille, 1889, St. 388, between Cape Horn and Tierra del Fuego, 121 m.

Fig. 67. *Marginella warrenii* Marrat, 1876, St. WS 244, north-west of Falkland Is., 253–247 m.

Fig. 68. *Venustatrochus georgianus* n.g. and n.sp., 40 × 40 mm. (holotype), St. 42, South Georgia, 120–204 m.

Fig. 69. *Kaitoa scaphandroides* n.sp., 23 × 9·2 mm. (paratype), St. 30, South Georgia, 251 m.

Fig. 70. *Kaitoa scaphandroides* n.sp., 19·2 × 8 mm. (holotype), St. 30, South Georgia, 251 m.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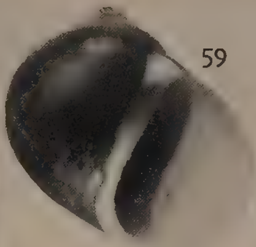
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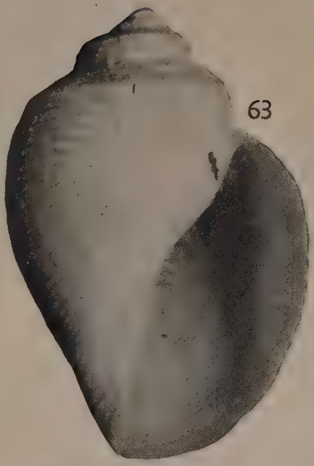
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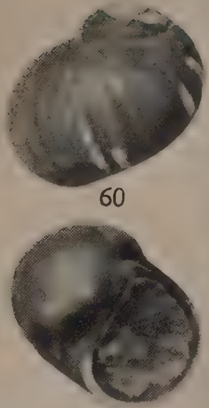
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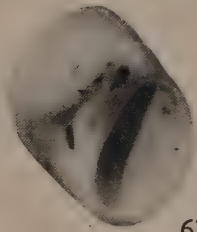
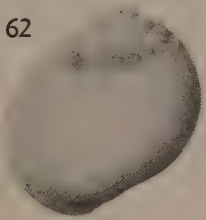
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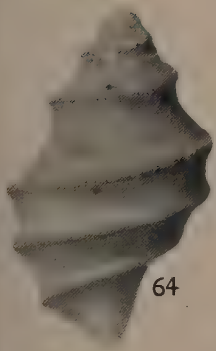
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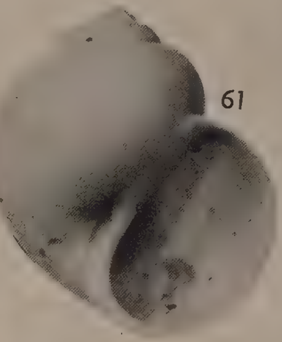
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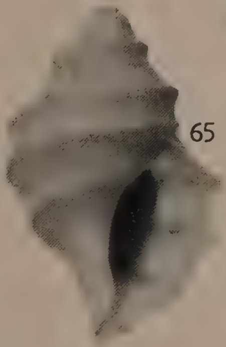
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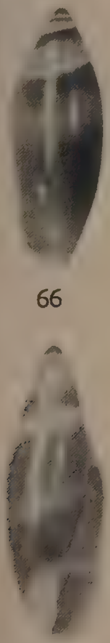
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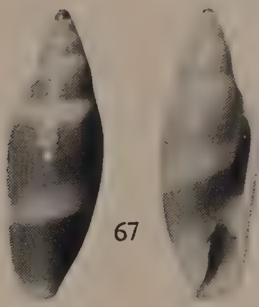
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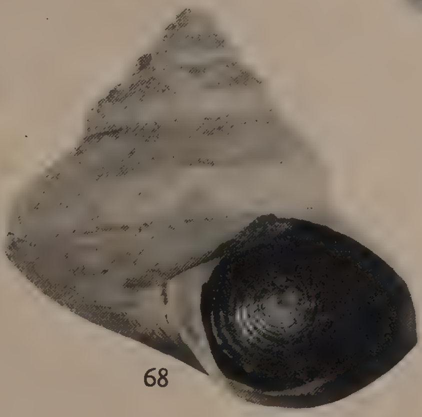
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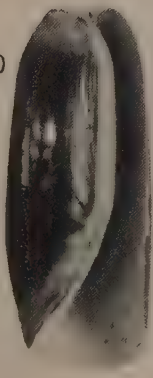
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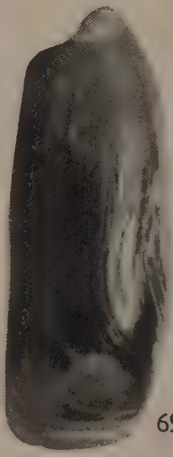
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THE VAMPYROMORPHA OF THE DISCOVERY EXPEDITIONS

By

GRACE E. PICKFORD

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THE VAMPYROMORPHA OF THE DISCOVERY EXPEDITIONS

By Grace E. Pickford
Bingham Oceanographic Laboratory, Yale University

(Text-figs. 1–4)

INTRODUCTION

During the years 1927 to 1937 the ships of the Discovery Committee captured nine specimens of the octopod, *Vampyroteuthis infernalis* Chun. This material contributes towards our knowledge of vampyromorph morphology, throws new light on the geographical range of the species, and tends to confirm previous findings with regard to vertical distribution and hydrographical correlations. A survey of previous investigations is contained in the following papers, Pickford (1946, 1949*a*, 1949*b*, 1950).

I am indebted to the National Institute of Oceanography (which has taken over the work of the Discovery Committee) for permission to examine these interesting specimens, and to Dr W. J. Rees for working facilities at the British Museum during the summer of 1951.

MORPHOLOGICAL CHARACTERS

Colour. In four cases the original colour of the specimen has been entered on the label. Specimen No. 99: 'Deep purple'; specimen No. 101: 'General tendency dark almost inky purple. Pale translucent purple where epidermis rubbed off'; specimen No. 102: 'Epidermis very deep inky purple, almost black. Translucent pale purple where skin stripped off'; and specimen No. 103: 'Intense deep purple'.

These observations are unexpected and interesting. The present colour of the external surface is black, as it is in all preserved specimens that are not totally faded as the result of prolonged storage in neutral formalin. The purple colour is evidently due to an unstable pigment that fades in preserving fluids. However, two points are worth noting. The formalin preserved specimens of the Bingham Oceanographic Collection retained a good deal of pink or red colour that could be seen on the suckers, the cirri, and the inside of the mantle where black and brown chromatophores are not present. Unpublished results of histological study show that this pigment is located in the epithelial cells, and not in chromatophores. In preserved specimens it is so faded as to be masked by underlying black or brown chromatophores in the subcutaneous tissues. One must suppose that in life an intense red or purple pigment in the epidermal cells would impart a purple tinge even to an otherwise black background. The writer has only seen freshly captured *Vampyroteuthis* on two occasions, while with the Danish 'Galathea' Deep Sea Expedition in 1951 in the Bay of Bengal. Unfortunately these specimens were badly rubbed and damaged; such colour as remained was black, but this may well have been due to destruction of the epidermis.

A further problem concerns the natural colour of the oral face of the web. The original coloured picture (Thiele, 1914) shows it as brown, and this colour has been repeatedly observed by the writer in formalin preserved specimens whenever they were not completely faded by the addition of borax for neutralization. A red-brown web was observed, for example, in the formalin preserved specimens of the Bingham Oceanographic Collection, and a check on the Bermuda series (Pickford, 1950) shows that here also the oral face is brown. It was therefore a surprise to find that the oral face of the web i black in the nine Discovery specimens which are preserved in alcohol. Presumably in life it may eve have been purple. An exactly similar observation was made on the Indian Ocean specimens taken b the 'Galathea'. Five of the Discovery specimens are from the Atlantic Ocean and we may therefor exclude the possibility of zoogeographical differences.

Table 1. *List of specimens, dates of capture and summary of distribution*

Spec. No.*	Stn	Date	Latitude	Longitude	Ocean basin†
96	269	26. vii. 1927	15° 55′ 00″ S	10° 35′ 00″ E	Angola basin
97	287	19. viii. 1927	02° 49′ 30″ S	09° 25′ 30″ W	Guinea basin
98	1587	3. v. 1935	06° 05′ N	52° 00″ E	Somali basin
99	1739	17. iv. 1936	32° 05·9′ S	105° 23′ E	Junction of Indo-Australian and South Australian basin
100	1764	6. v. 1936	32° 00′·8 S	36° 26·7′ E	Eastern extension of Agulhas basin in S. Indian ocean
101	2059	30. iv. 1937	09° 11·4′ S	05° 17·4′ W	Between Guinea and Angola basins
102	2061	1. v. 1937	06° 36′ S	06° 25·1′ W	Guinea basin
103	2065	4. v. 1937	02° 11·8′ S	06° 55·7′ W	Guinea basin
104	2080	29. x. 1937	10° 12·7′ S	04° 02′ W	Between Guinea and Angola basins

* Author's register of known specimens. Nos. 1–77 are listed in the Dana Reports (Pickford, 1946, 1949*a*), Nos. 78–9 in *The Vampyromorpha of the Bermuda Oceanographic Expeditions* (Pickford, 1950).

† Designations of basins from Sverdrup, Johnson & Fleming (1942).

Unpublished histological studies on the pigment cells of *Vampyroteuthis* have shown that th black pigment is in the form of rather large, spherical granules whereas the red-brown pigment is i the form of much smaller and more irregular granules that tend to clump in little aggregations, givin an appearance of reticulation to the chromatophore. Clearly there are physical if not chemic differences between the black and 'brown' chromatophores but it is possible that the latter onl assume their brown colour after certain methods of preservation. We cannot escape from the fac that in life, and in alcohol preserved specimens of the Discovery collections, the oral face of the we is black.

Mantle length. The observed mantle length of the specimens is given in Table 2, except for specime No. 96 which was too badly damaged for measurement. The larva of *Vampyroteuthis* goes throug a complicated double metamorphosis in which the posterior or larval fin reaches a length of abou 5 mm. and is then resorbed, while an anterior (adult) fin develops in smoothly co-ordinated function adjustment (Pickford, 1949*a*). The developmental stages are defined in terms of the presence absence and relative lengths of the two pairs of fins. It has further been shown that each develop mental stage is associated with a characteristic range of mantle length. But the mantle length several of the Discovery specimens appears to be in poor agreement with the developmental fin stage An attempt has therefore been made to deduce a corrected estimate of mantle length from measure ments of the eye diameter and of anterior fin length. The estimates are based on a previous investiga tion of the relationships between mantle length and other bodily proportions, given in the artic cited above. These estimates of corrected mantle length are given in Table 3. It will be seen that, general, the estimates are in good agreement with actual observation. However, specimen No. 10

vhich appears to be badly shrunken, is shown to have had a probable mantle length of 20–21 mm. nstead of 14 mm. On the other hand specimen No. 103, in which the subcutaneous gelatinous issues are clearly abnormally swollen, appears to have had a true mantle length of about 26 mm. as ompared with the observed value of 30 mm. In both these animals the corrected values are in better greement with the fin stage than the observed values. The posterior fin of specimen No. 101 is in poor condition and was certainly longer than the 2·5 mm. recorded in Table 2; we may assume that it was at least 60% of the length of the anterior fin. This would place the specimen in stage 3, but even this would be inappropriate to a larva of only 14 mm. mantle length whereas a mantle length of 20–21 mm. is entirely to be expected at this stage. The correction for specimen No. 103 is less striking since transitional specimens in the last stages of metamorphosis (stages 4–5) may range from 25 to 39 mm. in mantle length.

Table 2. *Morphological characters*

(Measurements in mm.)

Spec. No.	Sex	Mantle length	Eye diam.	Anterior fin length	Posterior fin length	Stage	Comments
96	♂	?	6·0	15·5*	Not vis.	?4	Left eye gone, mantle everted and badly distorted
97	?	10·5	2·9*	?	*c.* 2+*	?2	Mantle rubbed, fins poor
98	♂	28	6·0	12	0·6	4	
99	♀	47	16·5*	29*	Resorbed	5	Surface rubbed, right eye damaged
100	?♀	*c.* 10+	2·4	1·0	3·2	2	Condition very perfect, but mantle sac is everted
101	♀	14+	5·0	5·0	2·5+	?3	Rather shrunken
102	♂	25	6·5*	8·0	4·5	4	Skin rubbed
103	♂	30	*c.* 8* (through tissues)	14	Minute rudiment	4–5	Gelatinous tissues very swollen; right eye protrudes
104	♂	29	9·5	10·0	Minute rudiment	4–5	Skin rubbed

* Left side in better preservation and measured instead of right.

Table 3. *Estimates of true mantle length*

Spec. No.	Observed ML	Estimated from ED*	Estimated from FaL†
96	?	24·5	27
97	10·5	13	—
98	28	24·5	25·5
99	47	41	54
100	10+	12	14
101	14+	21	20·5
102	25	26	23
103	30	25	26·5
104	29	28	24·5

* The relationship between eye diameter (ED) and mantle length (ML) has been analysed by Pickford (1949*a*, pp. 75–6). The curve for adults was used for specimen No. 99, the curve for all stages was used for the two stage 4–5 specimens (Nos. 103 and 104), and the rest were taken from the curve for larvae.

† The relationships between anterior fin length (FaL) and mantle length has been analysed by Pickford (1949*a*, pp. 51–3). The adult curve was used for specimen No. 99, and the rest were determined from the curve for larvae.

Specimen No. 96 is too badly damaged for measurement but estimates from the eye diameter and from anterior fin length indicate a probable mantle length of 24·5–27 mm. There is no trace of a posterior fin, but, at a mantle length of 25 mm. or more, it is quite possible that the larval fin was in the last stages of resorption. The specimen is tentatively assigned to stage 4.

Specimen No. 97 is also interesting. Anterior fin buds cannot be seen on account of the poor condition of the specimen, yet, at a mantle length of 10·5 mm., it is most improbable that they were not originally present. The eye diameter indicates that the true mantle length may even have been somewhat greater, perhaps as much as 13 mm. The specimen may be assigned to stage 2 with some confidence and it may further be noted that, at the observed mantle length of 10·5 mm., the anterior fin rudiment was probably a triangular bud about 0·3 mm. in length.

Sex and stage. The preceding discussion permits a clear statement regarding developmental stages sex is determined by the presence or absence of a penis or penis rudiment which is visible even in very young male larvae.

The collection contains one half-grown adult, specimen No. 99, a female. Two specimens, Nos. 103 and 104, are in the final stage of metamorphosis with only minute posterior fin rudiments. Both these specimens are males as also are three more which have been assigned to the last larval stage viz. specimens No. 96, 98 and 102. As noted above, however, specimen No. 96 may really have already lost its larval fin. The remaining specimens consist of a four-finned larva (stage 3), which is specimen No. 101, a female, and two stage 2 larvae in which the anterior fin is a mere rudiment. One of the latter (specimen No. 97) cannot be sexed on account of poor preservation, nor can the anterior fin bud be seen although, as noted above, it must certainly have been present. Specimen No. 100 is rather well preserved although the mantle is everted, an anterior fin bud is present and the sex is almost certainly female as there is no trace of a penis rudiment.

Primary cirri. Previous investigations have brought to light the interesting possibility that there may be small racial differences between the *Vampyroteuthis* populations of the Atlantic and Indo-Pacific Oceans. Atlantic specimens appear to have one more pair of primary cirri, i.e. cirri that precede the first sucker, on the arms. The difference is not an absolute, all or nothing character, but far more Atlantic specimens have the larger number, and far more Indo-Pacific specimens the smaller.

Table 4. *Number of primary cirri*

Spec. No.	Left				Right				Comments
	1	2	3	4	1	2	3	4	
96	–	–	–	–	–	–	–	–	Condition does not permit an accurate count
97	8	7	6	6	?	7	6	6	–
98	8	7	7	6	8	7	7	6	–
99	8	7	6	5	8	?6–7	6	5	–
100	7	7	6	6	6+	6	6	6	One sucker on first arms, two on rest
101	?7	6	6	6	7	7	6	6	Very difficult to count
102	7	7	6	6	7	6	6	6	–
103	7	6	5	5	7	6	6	5	–
104	?7	–	–	5	7	6	5	4	First pair on R4 represented by a single (ventral) cirrus

The data for the Discovery specimens are tabulated in Table 4 and the results are summarized in Tables 5 and 6. It will be seen that the Discovery specimens contribute nothing towards the hypothesis of racial difference, in fact, for the first time, an Atlantic specimen (No. 104) is found to have a minimum number of four pairs of primary cirri. Nevertheless the overall data are still heavily weighted in favour of the racial hypothesis. The majority of Atlantic specimens have 8 or more pairs of primary cirri on the first or second arms (31 specimens out of 46); the majority of Indo-Pacific ecimens have seven or less (16 out of 26). Similarly on the third and fourth arms the majority of lantic specimens have six or more pairs (39 specimens out of 53), whereas the majority of Indo-cific specimens have five or less (19 specimens out of 29).

Table 5. *Summary of data on maximum number of pairs of primary cirri, situated normally on the first or second arms*

Group	Maximum number of pairs of primary cirri					Total no. specimens
	6	7	8	9	10	
Atlantic previous records	–	11	19	9*	2	41
‘Discovery’	–	4	1	–	–	5
Totals	–	15	20	9*	2	46
Indo-Pacific previous records	1	14	8	–	–	23
‘Discovery’	–	1	2	–	–	3
Totals	1	15	10	–	–	26

* Includes one specimen that may have possessed a tenth pair (Pickford, 1949*a*).

Table 6. *Summary of data on minimum number of pairs of primary cirri, situated normally on the third or fourth arms*

Group	Minimum number of pairs of primary cirri					Total no. specimens
	4	5	6	7	8	
Atlantic previous records*	–	12	28	7	1	48
‘Discovery’	1	1	3	–	–	5
Totals	1	13	31	7	1	53
Indo-Pacific previous records	4	17	4	1	–	26
‘Discovery’	–	1	2	–	–	3
Totals	4	18	6	1	–	29

* Includes data for the Bermuda series listed but not analysed previously (Pickford, 1950).

GEOGRAPHICAL DISTRIBUTION

e geographical distribution of the Discovery specimens is given in the list of specimens (Table 1) d shown graphically on the map (Fig. 1). Since none is from the Pacific this ocean has been itted except in so far as its periphery appears on the maps of the Atlantic and Indian Oceans. complete the picture it may be stated that there are five additional Pacific records, not shown in g. 1, which are rather uniformly distributed along a line between Panama and Australia, following e cruise of the ‘Dana’, 1928–30.

Six of the Discovery specimens are from the Eastern Atlantic, in the vicinity of the Guinea and gola Basins. This is a region already well known to be populated by *Vampyroteuthis*, and in fact e type specimen came from 1° 56·7′ S and 7° 40·6′ E in the Gulf of Guinea.

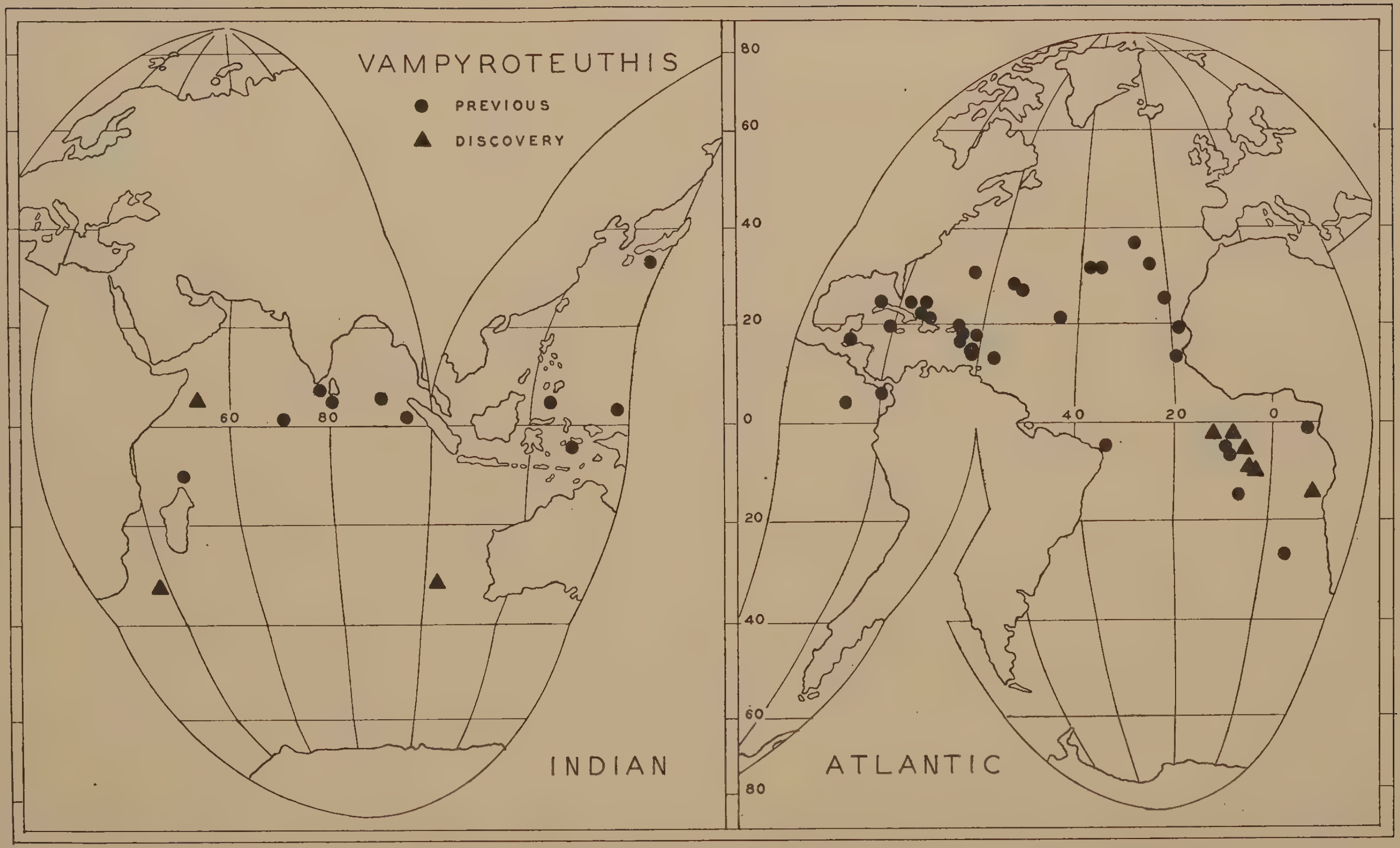
VAMPYROTEUTHIS
● PREVIOUS
▲ DISCOVERY
60
80
INDIAN
80
60
40
20
0
20
40
60
80
40
20
0
ATLANTIC

Fig. 1. Maps showing the distribution of *Vampyroteuthis infernalis* in the Indian Ocean (left) and in the Atlantic (right).

The three remaining specimens are more interesting since each one adds a new record from a hitherto unknown region. Specimen No. 98 is from the Somali Basin, near where the Red Sea discharges into the Arabian Sea. Its presence here is entirely to be expected, in view of adjacent records from north of Madagascar and west of Ceylon. Specimen No. 100 from off South Africa in the South Indian Ocean is a most welcome record confirming the hypothesis advanced previously (Pickford, 1946) that the *Vampyroteuthis* populations of the South Atlantic and Indian Oceans must be in free communication with each other by way of suitable water masses passing south of Cape Agulhas.

Finally, specimen No. 99 is of exceptional interest since it is the first record of *Vampyroteuthis* from off Western Australia. The writer has suggested that *Vampyroteuthis* probably occurs in suitable water south of Australia and that the Indo-Pacific populations may be in free communication by this route. The present record appears to favour this hypothesis but more data are required to establish the continuity south of Australia.

VERTICAL DISTRIBUTION

The sounding and depth of capture are listed in Table 7. Six of the nine specimens were taken in nets towed at accurately known depths that were determined with the aid of a depth recorder. Three of these nets were closed before being hauled to the surface, but the other three were hauled open to the surface, either because no closing mechanism was used or because the mechanism failed to operate. Nevertheless it is most probable that the specimens were taken at the depth of towing since the net was fishing at that depth for a much longer time than on the way to the surface. It has been necessary to make this assumption in all previous studies although, in the case of the Dana material it was possible to introduce a correction for specimens captured during lowering and raising of the net. This is not possible for the Discovery records.

Table 7. *Summary of data on net type, sounding and depth of capture*

Spec. No.	Station	Sounding (m.)	Net type*	Depth† (m.)	Depth recorder‡
96	269	—	TYF	600–700 (–0)§	DGB
97	287	—	TYF	800–1000 (–0)	DGB
98	1587	5098	TYF B	1250–800	DGP
99	1739	5400	TYF B	3000–2000 (–0)	DGP
100	1764	2430	N 450 B	1000–0	—
101	2059	4370	N 450 B	1400–0	—
102	2061	4390	N 450 B	1500–0	—
103	2065	4849	N 450 B	1600–1400	DGP
104	2080	5305	TYF B	1750–950‖	DGP

* TYF = Young fish trawl; B = oblique haul; N 450 = 4·5 m. tow net.

† The symbol (–0) means either that no closing mechanism was used or that 'the net failed to close at some intended intermediate depth and fished all the way to the surface'.

‡ DGB = Depth gauge, Budenberg pattern; DGP = Pressure depth gauge, a modification of the Budenberg pattern.

§ Note on original label 'Ceph. fragments (–0)'.

‖ Note on original label 'Caught in upper netting'.

The vertical distribution is in general agreement with previous investigations. The six Atlantic specimens were taken, presumably, in depths ranging from 600 to 1750 m. Forty-three out of 53 previously recorded Atlantic specimens were taken with towlines of 2000–4000 metres of wire (Pickford, 1950), i.e. at depths of 1000–2000 m. Similarly the three Indian Ocean specimens are from 800 to 3000 m., and previous records for the Indian Ocean are all from 1000 to 2000 m. estimated depth.

The only point of interest pertains to the shallowest depth at which the species may occur. In the Atlantic the 'Dana' captured two specimens at St. 1322, one with a towline of 1600 m.w., the other with 1900 m.w. In the Philippines Basin, at St. 3751, she took one specimen with a towline of only 1000 m.w. The 'Pawnee' took one Atlantic specimen with a towline of 1981 m.w. at St. 56, but this is so close to 2000 that it may well be disregarded. The difficulty with all these records is the interpretation. In the middle depths, with towlines of 2000–6000 m.w. it is probable that the approximate depth of capture may be at one-half the length of the towline. With shorter lengths of cable the matter becomes less certain and the 'Dana' considered that in shallower depths, with less than 1000 m.w., a better estimate of fishing depth was at one-third the length of the cable.

Using the deeper estimate we may say that previous records of *Vampyroteuthis* from shallower water have been made at depths of 800–890 m. in the Atlantic Ocean, and 500 m. in the Philippines Basin. If we convert these estimates to depths at one-third the length of the towline they become 533–660 m. and 333 m. respectively. The data for the Discovery specimens would be more decisive, since depth recorders were used, were it not for the fact that several of the nets were hauled to the surface without closing. However, it is certain that specimen No. 96 was not taken below 700 m. and most probable that it was captured at the depth of towing, 600–700 m. Similarly, specimen No. 97 could not have been taken below 1000 m. and was probably taken between 800 and 1000 m. In the case of specimen No. 98 the closing device operated successfully and we can definitely state that this animal was taken between 1250 and 800 m.

As far as the information goes it appears to indicate that previous estimates for shallow water captures should be taken at half the length of the cable and that the species rarely if ever occurs above 500 m.

In regard to proximity to the bottom, it will be noted that all the Discovery specimens were taken in middle depths over deep or very deep water. None could have been taken within even 1000 m. of the bottom.

Table 8. *Summary of hydrographic data*

Spec. No.	Prob. depth capture (m.)	Hydrogr. station*	Hydrographic data			
			Depth (m.)	Temp. (° C.)	Salinity (‰)	Density (σ_t)
96	600–700	265	600	6·88	34·56	27·11
			800	6·74	34·56	27·12
97	800–1000	289	800	6·27	34·50	27·15
			1000	4·68	34·50	27·33
98	1250–800	1588	790	8·69	35·22	27·37
			990	7·53	35·19	27·51
			1490	4·92	35·01	27·72
99	3000–2000	1740	1950	2·48	34·71	27·73
			2430	2·03	34·72	27·77
			2920	1·67	34·72	27·79
103	1600–1400	2062	1380	4·01	34·92	27·74
			1570	3·82	34·97	27·81
104	1750–950	2058†	990	4·06	34·58	27·47
			1190	3·87	34·73	27·61
			1390	3·75	34·85	27·71
			1590	3·55	34·93	27·80

* That nearest to station of capture and at about same date unless otherwise indicated. Data from the Station Lists (*Discovery Reports*, vol. 1, 22 and 24).

† The specimen was taken at Stn 2080 in October 1937, the hydrographic data are for April 1937.

HYDROGRAPHIC CORRELATIONS

The hydrographic data for stations adjacent to the place of capture and at depths corresponding to the probable depth of capture, are summarized in Table 8. Selected mean values used for plotting are given in Table 9. The writer is deeply interested in the distribution of bathypelagic marine organisms in relation to water types and has suggested the use of temperature-salinity charts for the

Table 9. *Selected or interpolated values of temperature and salinity at the most probable mean depth of capture, derived from Table 8 and used in plotting the distribution in relation to water types (Figs.* 2, 3 *and* 4)

Spec. No.	Selected depth (m.)	Estimated temp. (° C.)	Estimated salinity (‰)
96	700	6·80	34·56
97	900	5·40	34·50
98	990	7·53	35·19
99	2430	2·03	34·72
103	1475	3·90	34·95
104	1290	3·80	34·70

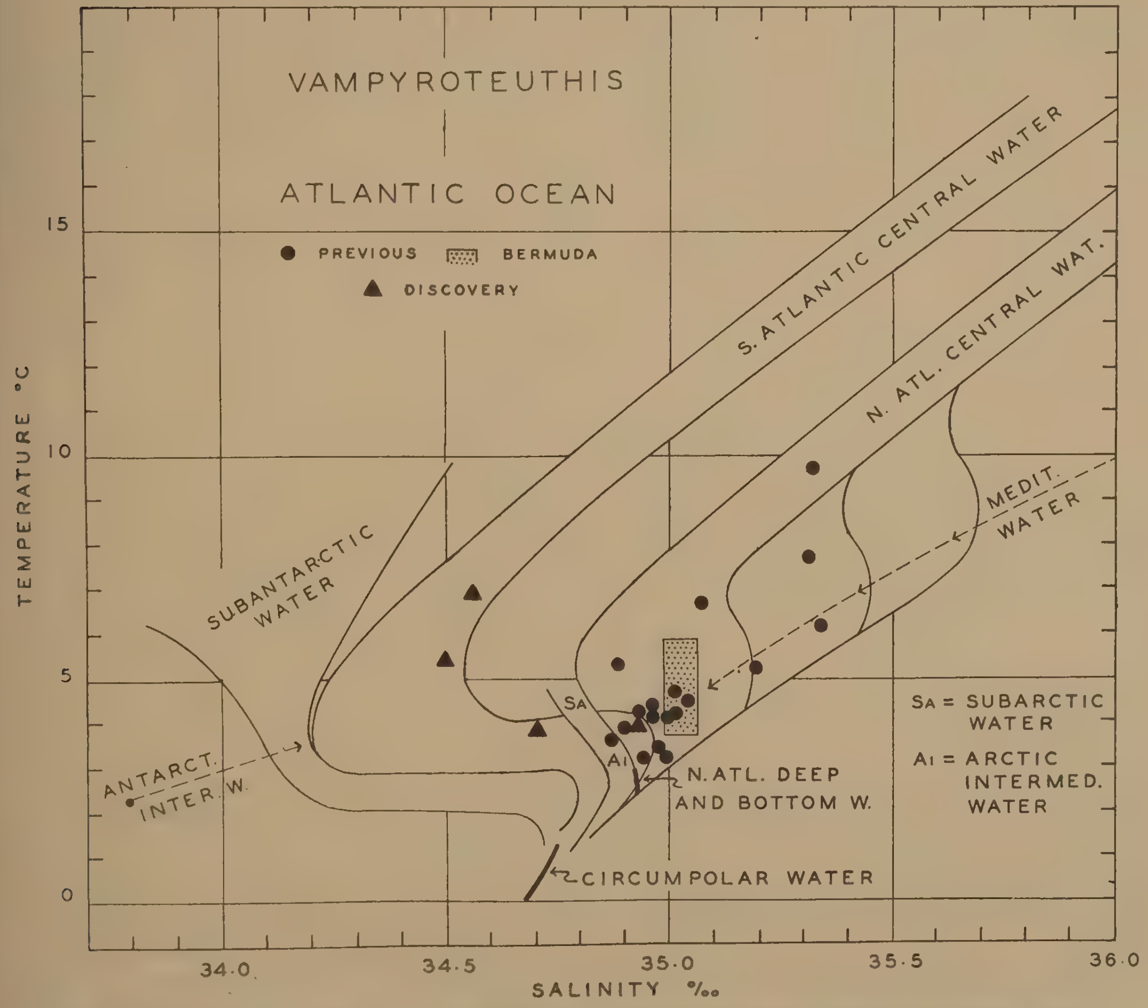

Fig. 2. The distribution of *Vampyroteuthis infernalis* in relation to the water masses of the Atlantic Ocean.

analysis of hydrographic correlations (Pickford, 1946). The distribution of *Vampyroteuthis* in relation to the water masses of the Atlantic and Indian Oceans is shown in Figs. 2 and 3. The names adopted here for the various water masses are those used by Sverdrup, Johnson & Fleming (1942). In the Atlantic the species inhabits the upper layers of the Deep Water and moves upwards into the North Atlantic Central Water. New records made by the 'Discovery' show that it also moves upwards into the South Atlantic Central Water. This was entirely to be expected, but it is satisfactory to have verification.

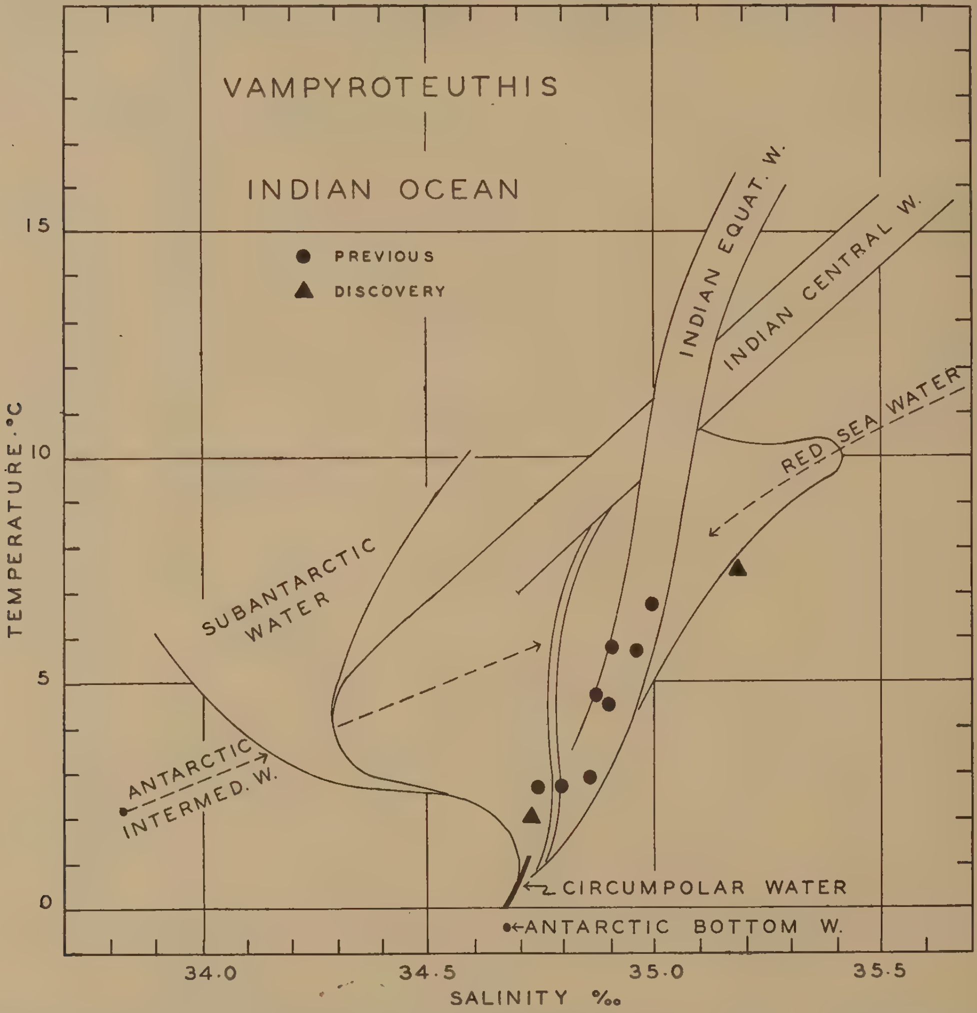

Fig. 3. The distribution of *Vampyroteuthis infernalis* in relation to the water masses of the Indian Ocean.

In the Indian Ocean the few previous records are from the Indian Deep Water and upwards into the Indian Equatorial Water. One of the two Discovery records is from the Deep Water. The other, specimen No. 98 from the Somali Basin, is from a region where Red Sea Water is flowing out to join the Equatorial Water. At the present time there are no records from Indian Central Water.

The distribution of *Vampyroteuthis* in relation to temperature, salinity, and density is further summarized in Fig. 4 in which the new records are indicated in solid black. Empirically the species appears to be restricted to water of salinities between 34·4 and 35·4‰, of temperatures between 2 and 10° C., and of densities between σ_t 27·0 and 27·9. Dr E. F. Thompson has suggested that the last nentioned is the determining factor and that the species is passively caught in a layer of constant lensity. Nevertheless the animals appear to be strongly stenohaline and are not found in waters of uitable density when the salinity is less than 34·4‰. Yet there are cold waters of low salinity and ppropriate density at suitable depths. The upper limits of temperature-salinity tolerance are more eadily explainable since in passing them the animal would be led into regions above the oxygen ninimum where light penetrates and so into what is well known to be a totally different life zone.

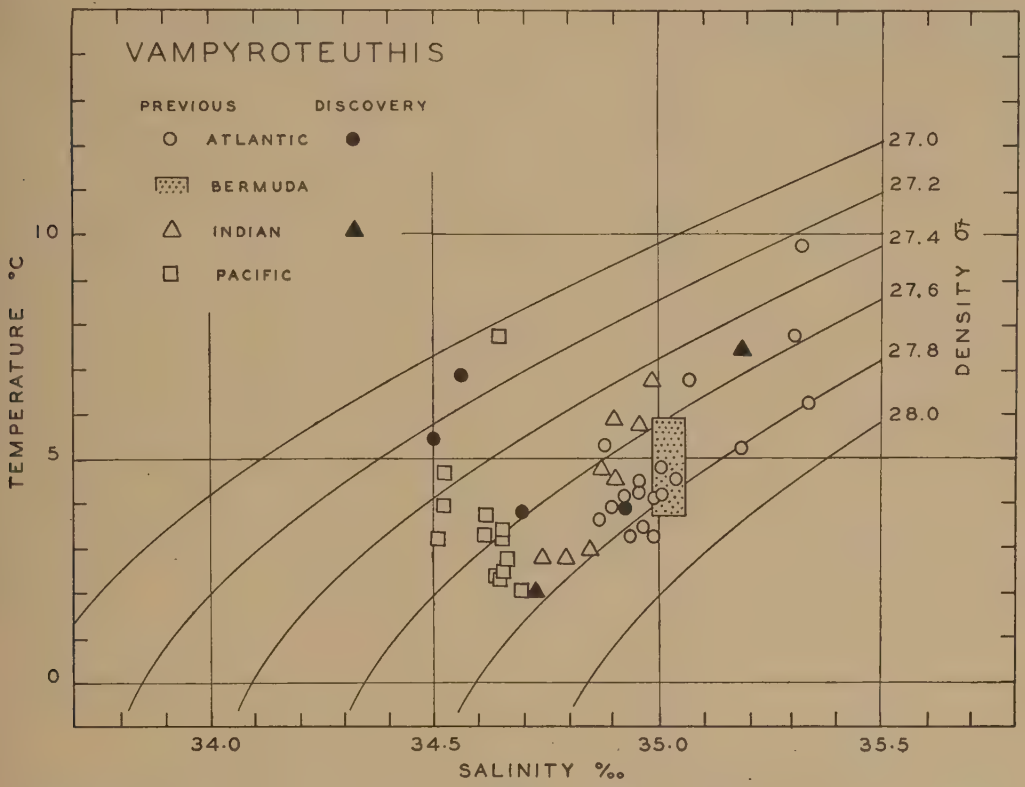

Fig. 4. The distribution of *Vampyroteuthis infernalis* in relation to salinity, temperature and density.

In regard to the individual records, it will be noted that the Discovery specimens from the South Atlantic Central Water fall among the Pacific group, whereas the specimen from the Somali Basin finds itself in water of high salinity and temperature, of a type hitherto known to be inhabited by *Vampyroteuthis* only in the Atlantic. Evidently, within the limits of temperature-salinity tolerance, the geographical region is of no importance.

SUMMARY

1. Nine specimens of *Vampyroteuthis infernalis* Chun were captured by the Discovery Expeditions between the years 1927 and 1937.

2. The colour of the living animal is deep purple rather than jet black. This colour is due to a red or purple pigment in the epidermal cells which fades after preservation. The oral face of the web is black, or perhaps deep purple, not brown as previously described. The latter colour is apparently an artifact of preservation.

3. Eye diameter and anterior fin length are used to adjust the observed mantle length in cases of damage, shrinkage or distortion. Subject to such correction the specimens are found to fall into size

ranges appropriate to their developmental fin stage. There is one immature adult, five metamorphosing larvae (stage 4 or 4–5), and three younger larvae.

4. The number of pairs of primary cirri adds nothing to the hypothesis that there is a racial difference in this respect between the Atlantic and Indo-Pacific populations. Nevertheless the tabulation of known data is still heavily weighted in favour of the view that Atlantic specimens tend to have an additional pair of primary cirri on all arms. One Atlantic specimen with a minimum of only four pairs is recorded.

5. The six Atlantic specimens are from the Guinea and Angola Basins where *Vampyroteuthis* is known to occur. The three Indian Ocean specimens provide a corresponding number of unique records, from the Somali Basin, the eastern extension of the Agulhas Basin and the region of junction of the Indo-Australian and South Australian Basins. The last two records tend to confirm the hypothesis of open communication between the *Vampyroteuthis* populations of the Atlantic, Indian and Pacific Oceans by pathways passing south of South Africa and south of Australia.

6. The vertical distribution of the Discovery specimens, from 600 to 3000 m., is rather accurately known through the use of closing nets and depth-recording gauges. The range corresponds with previous estimates in which depth of capture was taken to be at one-half the length of the cable. The upper limit for the species is probably not less than 500 m.

7. Hydrographical data are available for four Atlantic and two Indian Ocean specimens. Three Atlantic specimens are from South Atlantic Central Water, expected but not hitherto known to be inhabited by *Vampyroteuthis*. The specimen from the Somali Basin is from a region of high salinity and temperature where the Red Sea Water flows out into the Indian Equatorial Water. The two remaining specimens are from Atlantic Deep and Indian Deep Water respectively.

8. The newly recorded specimens are distributed within previously established co-ordinates delimiting the salinity (34·4–35·4‰), temperature (2–10° C.), and density (σ_t 27·0–27·9) tolerances of the species.

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[*Discovery Reports. Vol. XXVI, pp.* 211–258, *Plates XI, XII, April* 1953]

DISCOVERY INVESTIGATIONS STATION LIST

R.R.S. 'WILLIAM SCORESBY'

1950

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DISCOVERY INVESTIGATIONS
STATION LIST
R.R.S. ‘WILLIAM SCORESBY’
1950

(Plates XI, XII)

INTRODUCTION

This list contains particulars of the observations made by the R.R.S. ‘William Scoresby’ during her eighth commission, between January and November 1950. Station Lists including the earlier observations made by the same ship have already appeared in vols. I, II, IV and XXV of the *Discovery Reports*, and the present stations (WS 960–1107), although separated from the pre-war work by a gap of twelve years, are numerically continuous with it.

It was intended that the eighth commission of the ‘William Scoresby’ should mainly be devoted to whale-marking in tropical and sub-tropical waters, but a limited amount of oceanographical work and experimental fishing was also planned.

The first four stations (WS 960–963) were worked on the continental shelf and slope south-west of Ireland, in co-operation with the Marine Biological Association of the United Kingdom. Following this, a survey of the waters off the coast of South-West Africa (WS 964–1002) was made. After some fishing experiments (WS 1003–1012) off East London, a few oceanographical stations were worked in the central Indian Ocean (WS 1013–1020). Shore collections (WS 1021) were made at Mauritius, and two trawling stations (WS 1022, 1023) were worked south of Madagascar.

Unavoidable modifications in programme increased the amount of time available for oceanographical work, and made it possible to work two lines of stations across the Mozambique Current (WS 1024–1030) and the Agulhas Current (WS 1031–1040) in addition to the repetition of the survey off the South-West African coast (WS 1043–1107).

Salinity samples were analysed subsequently ashore, as on previous commissions of the R.R.S. ‘William Scoresby’, a necessity in view of the limited laboratory accommodation on so small a ship, but special arrangements were made for the estimation of phosphate and dissolved oxygen content on board. All such determinations were made within 10–20 hours of the collection of the samples.

Phosphate analysis was done by the Atkins-Denigès molybdenum blue method, and the colour comparison made in a Lovibond-type colorimeter with a series of thirty-three specially made glass slides, with colours flashed on to them, representing a range of 0·03–3·00 mg. atoms P/m^3. These slides were precalibrated in a shore laboratory with standard phosphate solutions made up in phosphate-free sea water, obviating the need for salt-error correction. Dissolved oxygen content was determined by the usual Winkler method.

During the second survey off South-West Africa, a number of wire soundings were made to ascertain the nature of the bottom. These have been given station numbers, and the abbreviations denoting the nature of the bottom are those used by the Hydrographic Department of the Admiralty, 1946.[1] The following appear in this Station List:

bl	black
br	brown
c	coarse
Co	coral
d	dark
Di	diatom
Fr	foraminifera
Gl	globerigina
gn	green
gy	grey
h	hard
lt	light
M	mud
Oz	ooze
R	rock
S	sand
Sh	shells
sk	speckled
St	stones
y	yellow

---

[1] Chart No. 5011.

The symbol ∸ placed above the sounding figure signifies that no bottom was reached at that depth, and an asterisk following the depth indicates that the figure was obtained by echo-sounding.

Some of the bottom deposits off the South-West African coast emit a characteristic smell of hydrogen sulphide, and where this occurred H_2S has been placed beside the appropriate abbreviation.

The state of sea and swell is expressed by the appropriate number in the Douglas Sea and Swell Scale, which is as follows:

	Sea		Swell
0	Calm	0	No swell
1	Smooth	1	Low swell, short or average length
2	Slight	2	Low swell, long
3	Moderate	3	Moderate swell, short
4	Rough	4	Moderate swell, average length
5	Very rough	5	Moderate swell, long
6	High	6	Heavy swell, short
7	Very high	7	Heavy swell, average length
8	Precipitous	8	Heavy swell, long
9	Confused	9	Confused swell

The following Beaufort notation has been used to express the state of the weather:

b	blue sky with clear or hazy atmosphere, or sky not more than one-quarter clouded.
bc	sky between one-quarter and three-quarters clouded.
c	mainly cloudy (not less than three-quarters clouded).
d	drizzle or fine rain.
e	wet air without rain falling.
fe	wet fog.
m	mist.
o	overcast sky (i.e. whole sky covered with unbroken cloud).
p	passing showers.
r	rain.
z	dust haze; the turbid atmosphere of dry weather.

The times of the observations are given in ship's time expressed on the 24-hour system ending with midnight (0000). The hours to be added to, or subtracted from, ship's (or zone) time to give GMT are noted in the 'Remarks' column, this difference holding good until another entry is made. For example at Station WS 964, "GMT=zone–1 hr" means that one hour is to be subtracted from ship's time to give GMT. Times in heavy type refer to biological observations made between sunset and sunrise.

The following symbols are used for nets, apparatus, etc.:

B	Oblique.
BT	Bathythermograph, standard U.S. Navy pattern, OC 2A/S, manufactured by Wallace and Tiernan Products, Inc., New Jersey.
DC	Conical dredge. Mouth 16 in. (40·5 cm.) in diameter, with a canvas bag.
DLH	Large rectangular dredge. Heavy pattern, 4 ft. (1·2 m.) long.
H	Horizontal.
KT	Kelvin sounding tube.
LH	Hand lines.
LL	Long lines (a fleet of two lines, each 460 fathoms long).

LS	Experimental improvised line, 235 fathoms long, with end made fast to ship. Outboard end carried a 50 lb. weight and was rigged with 16 traces and hooks.
N 50	50 cm. silk tow-net. Mouth circular, 50 cm. (19·5 in.) diameter: 200 meshes to the linear inch.
N 70	70 cm. tow-net. Mouth circular, 70 cm. (27·5 in.) diameter: mesh graded, at cod-end of silk, with 74 meshes to the linear inch.
N 100	1 m. tow-net. Mouth circular, 1 m. (3·3 ft.) diameter: stramin, with 10–12 meshes to the linear inch.[1]
NH	Hand net.
OTC	Commercial otter trawl. Head rope 74 ft. (22·6 m.) long; mesh at cod-end 1½ in. (3·8 cm.).
Sh. Coll.	Shore collecting.
SSL	Lumby surface sampler, for collecting surface water samples while under weigh. Modified version, as described by J. R. Lumby 1928.[2]
TNL	Large fish trap, 12 × 6 × 6 ft.: a rigid metal frame covered with wire netting of 1 in. mesh, and having two funnel-shaped entrances.
TYF	Young fish trawl. A bag of stramin, 10–12 meshes to the linear inch, attached to a circular frame 2 m. (6·6 ft.) in diameter, with a bucket at the cod-end.
V	Vertical.

The addition of the symbols B, H or V to those used for the tow-nets indicates whether they were hauled obliquely, horizontally or vertically. Where the depth interval indicates that a net fished vertically was closed, this was effected on the Nansen principle. The maximum depths reached by horizontal and oblique nets were determined by the use of Kelvin sounding tubes, and this is recorded by insertion of the symbol KT in the 'Remarks' column. Wire angles, expressed as deviations from the vertical and determined by a simple inclinometer, are given for water samples collected with the Nansen-Pettersson water-bottle, but no correction to the depth has been applied. Depths of reversing water-bottles have been calculated from the thermometric depths, using the method of Pollack.[3] The small index figure placed against the figure for depth shows from which hoist of water bottles the sample was obtained.

The Bathythermograph conformed to the standard of accuracy laid down by the makers; it was calibrated frequently during the commission, showing negligible variance from the original calibration. The depth limit of this instrument is 450 ft. (138 m.). It was our practice to work it with the ship hove to, since we worked a vertical net at all our BT stations, and therefore no time was lost by departing from the normal U.S. Navy method of using the instrument with the ship under way. This explains why we were so frequently able to work the instrument down to the lower limit of its range.

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[1] Earlier versions of the N 100 were of graded mesh, but also had stramin at the cod-end.

[2] Journ. du Conseil, III, No. 3, pp. 340–50.

[3] Pollack, M. J., 1950. *Notes on determining the depth of sampling in serial oceanographic observations.* Journ. Mar. Research, IX, No. 1.

R.R.S. 'WILLIAM SCORESBY'
STATIONS WS 960–1107

18. i. 1950—14. x. 1950

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Te
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 960	50° 34′ N, 10° 40′ W	1950 18 i	1430–1600	168*	Var	2	NW	—	—	—	o	1037·0	8·9
WS 961	50° 34′ N, 11° 00′ W	18 i	1731–1934	515*	Lt airs	< 1	—	—	NW	2	bc	1037·0	8·9
WS 962	50° 34′ N, 11° 10′ W	18 i	2033–2355	922*	Lt airs	< 1	—	—	NW	2	bc	1040·0	8·9
WS 963	From 50° 34′ N, 11° 30′ W to 50° 41′ N, 11° 43′ W	19 i	0805–1750	1311*	SE	17–27	SE	3–4	SE	4	o	1032·0	10·0
WS 964	19° 44′ S, 10° 46′ E	4 iii	1220–1246	—	SSE	11–21	SSE	3	SSE	4	bc	1014·0	20·6
WS 965	19° 44′ S, 11° 04′ E	4 iii	1440–1459	1110*	SSE	11–21	SSE	3	SSE	4	bc	1013·0	20·6

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermometer	Wire angle	Temp. °C.	S ‰	σt	Mg.-atom m.^{3}		O_2 c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
0	0	—	—	11·46	35·47	27·08	0·51	—	—	**N 70 V**	50–0	1440	—	GMT = Ship's time
	10	—	—	11·46	35·46	27·07	0·53	—	—	,,	100–50			
	20	—	—	11·46	35·45	27·06	0·49	0·61	—	,,	150–100	—	1520	
	50	—	—	11·45	35·44	27·05	0·48	—	—	**N 100 B**	80–0	1553	1600	KT
	100	—	—	11·46	35·45	27·06	0·48	0·63						
	150	—	—	11·48	35·42	27·04	0·48	0·62						
0	0	—	—	11·25	35·43	27·08	0·52	—	—	**N 70 V**	100–0	1737		
	10	—	—	11·27	35·45	27·09	0·54	—	—	,,	200–100			
	20	—	—	11·26	35·43	27·08	0·53	0·72	6·10	,,	300–200			
	50	—	—	11·25	35·43	27·08	0·54	—	—	,,	500–300	—	1840	
	100	—	—	11·26	35·42	27·08	0·56	0·66	5·93					
	150	—	—	11·27	35·46	27·10	0·58							
	200	—	—	11·26	—	—	0·53	0·73	5·90					
	250	—	—	11·25	35·47	27·12	0·53							
	400	—	—	10·94	35·38	27·11	0·75							
0	0	—	—	11·31	—	—	0·56	—	—	**N 70 V**	100–0	2040		
	10	—	—	11·32	35·45	27·08	0·55	—	—	,,	200–100			
	20	—	—	11·32	35·43	27·07	0·53	0·72	5·95	,,	300–200			
	50	—	—	11·31	35·44	27·08	0·53	—	—	,,	500–300			
	100	—	—	11·30	35·45	27·09	0·55	0·69	6·23	,,	700–550	—	—	Closed prematurely
	150	—	—	11·31	—	—	0·54	—	—	,,	900–700	—	2230	
	200	—	—	11·32	35·44	27·07	0·56	0·71	6·11					
	300^2	304	—	11·19	35·44	27·10	0·67							
	410^2	—	—	10·88	35·38	27·12	0·72	—	5·53					
	520^2	517	—	10·63	35·38	27·16	0·83							
	600^1	599	—	10·34	35·36	27·20	1·00							
	810^1	—	—	9·71	35·45	27·37	1·18	1·39						
	910^1	912	—	9·47	35·46	27·42	1·13	1·32	4·38					
1	0	—	—	11·27	35·44	27·08	0·54	—	5·62	**N 70 V**	1300–1100	0810		
	10	—	—	11·26	35·44	27·09	0·56	—	—	,,	1100–900			
	20	—	—	11·25	35·39	27·05	0·55	0·74	5·30	,,	900–700			
	50	—	—	11·25	35·40	27·06	0·54	0·71	—	,,	700–500			
	100	—	—	11·25	35·43	27·08	0·55	0·70	6·15	,,	450–0	—	—	Foul wire
	150	—	—	11·26	35·39	27·05	0·53	—	—	,,	200–100			
	200	—	—	11·29	35·42	27·07	0·54	0·70	6·30	,,	100–0	—	1350	
	250	—	—	11·29	35·44	27·08	0·54	—	—	,,	500–300	1630	—	Bad stray on nets
	300	—	—	11·16	35·39	27·07	0·65	—	—	,,	300–200	—	1730	
	400	—	—	10·89	35·41	27·14	0·75	0·93	5·72					
	510^4	505	—	10·54	35·40	27·19	0·97							
	590^4	—	—	10·25	35·36	27·21	0·94	1·05	4·10					
	680^4	681	—	10·03	35·38	27·27	1·01							
	790^3	791	—	9·72	35·44	27·36	1·04	1·21	4·71					
	850^3	—	—	9·57	35·45	27·39	1·13							
	910^3	911	—	9·47	35·47	27·43	1·12	1·31	4·38					
	970^2	965	—	9·30	35·47	27·46	1·13	1·34	4·37					
	1000^2	—	—	8·96	35·47	27·51	1·19	1·32	4·41					
	1040^2	1043	—	8·81	35·46	27·53	1·16	1·30	4·52					
	1100^1	1103	—	8·62	—	—	1·20	1·33	4·74					
	1200^1	—	—	8·12	35·46	27·64	1·19	1·33	4·57					
	1310^1	1309	—	7·56	35·37	27·65	1·22	—	4·82					
15	0	—	—	21·7	—	—	0·13	—	—	**BT**	138–0	1225	1235	GMT = zone – 1 hr
	10	—	—	21·6	—	—	—	—	—	**N 50 V**	100–0	1229	1242	
	20	—	—	21·4	—	—	—	—	—	**SSL**	0	1242	1246	
	30	—	—	21·4										
	50	—	—	15·7										
	75	—	—	14·4										
	100	—	—	13·7										
	138	—	—	13·0										
15	0	—	—	21·7	—	—	0·20	—	—	**BT**	138–0	1445	1453	
	10	—	—	21·5	—	—	—	—	—	**N 50 V**	100–0	1445	1453	
	20	—	—	21·3	—	—	—	—	—	**SSL**	0	1455	1459	

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Ten
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 965 *cont.*	19° 44′ S, 11° 04′ E	1950 4 iii											
WS 966	19° 44′ S, 11° 22′ E	4 iii	1655–1714	683*	SSE	7–16	SSE	3	SSE	4	bc	1013·0	20·6
WS 967	19° 44′ S, 11° 41′ E	4 iii	1915–1935	376*	SE × S	11–16	SSE	4	SSE	4	o	1014·4	20·0
WS 968	19° 44′ S, 12° 01′ E	4 iii	2130–2149	304*	SE	7–10	SSE	3	SSE	3	o	1014·4	19·4
WS 969	19° 44′ S, 12° 20′ E	4–5 iii	2345–0004	179*	SSE	5	S	2	S	2	bc	1012·4	18·9
WS 970	19° 44′ S, 12° 40′ E	5 iii	0200–0217	113*	S	5	S	2	S	2	bc	1011·0	18·3
WS 971	20° 11′ S, 12° 30′ E	5 iii	0600–0619	204*	S	4–10	S × W	2	S × W	4	o	1013·0	18·3

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermo-meter	Wire angle	Temp. °C.	S °/₀₀	σt	Mg.-atom m.³		O₂ c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
15	30	—	—	21·3										
	40	—	—	21·3										
	50	—	—	17·5										
	75	—	—	14·7										
	100	—	—	14·1										
	138	—	—	12·8										
15	0	—	—	21·75	—	—	0·20	—	—	N 50 V	100–0	1657	1707	Surface temperature by Nansen-Pettersson water-bottle
	10	—	—	21·6	—	—	—	—	—	BT	138–0	1707	1714	
	20	—	—	21·5										
	30	—	—	21·4										
	40	—	—	16·5										
	50	—	—	15·6										
	75	—	—	14·1										
	100	—	—	13·3										
	138	—	—	12·6										
15	0	—	—	21·6	—	—	0·20	—	—	N 50 V	100–0	1917	1929	
	10	—	—	21·5	—	—	—	—	—	BT	138–0	1925	1935	
	20	—	—	18·9	—	—	—	—	—	SSL	0	1932	1935	
	30	—	—	17·0										
	40	—	—	15·7										
	50	—	—	15·1										
	75	—	—	14·2										
	100	—	—	13·6										
	138	—	—	12·8										
15	0	—	—	19·5	—	—	0·50	—	—	BT	138–0	2135	2145	
	10	—	—	19·5	—	—	—	—	—	N 50 V	100–0	2137	2143	
	20	—	—	19·3	—	—	—	—	—	SSL	0	2145	2149	
	30	—	—	18·5										
	50	—	—	16·8										
	75	—	—	15·2										
	100	—	—	14·6										
	138	—	—	13·0										
15	0	—	—	18·7	—	—	0·83	—	—	N 50 V	100–0	2349	0000	
	10	—	—	18·4	—	—	—	—	—	BT	138–0	2350	0000	
	20	—	—	18·3	—	—	—	—	—	SSL	0	0000	0004	
	30	—	—	17·2										
	40	—	—	15·7										
	50	—	—	15·2										
	75	—	—	15·0										
	100	—	—	14·8										
	138	—	—	14·6										
16	0	—	—	18·7	—	—	0·46	—	—	N 50 V	100–0	0202	0212	
	10	—	—	18·4	—	—	—	—	—	BT	110–0	0205	0212	
	20	—	—	17·0	—	—	—	—	—	SSL	0	0215	0217	
	30	—	—	16·6										
	50	—	—	15·8										
	75	—	—	15·4										
	100	—	—	14·8										
	110	—	—	14·7										
16	0	—	—	19·1	—	—	0·42	—	—	N 50 V	100–0	0602	0612	
	10	—	—	19·1	—	—	—	—	—	BT	138–0	0605	0615	
	20	—	—	19·0	—	—	—	—	—	SSL	0	0615	0619	
	30	—	—	18·8										
	40	—	—	17·4										
	50	—	—	16·6										
	75	—	—	15·4										
	100	—	—	14·4										
	138	—	—	13·5										

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Te
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 972	20° 36′ S, 12° 20′ E	1950 5 iii	1015–1031	344*	SSW	7–10	S	2	S	3	0	1016·0	18·9
WS 973	21° 07′ S, 12° 10′ E	5 iii	1429–1452	—	S	11–16	S	3	SSW	4	0	1014·0	18·9
WS 974	21° 35′ S, 11° 58′ E	5 iii	1848–1900	—	SE	17–21	SSE	3	SSE	5	0	1014·2	18·3
WS 975	22° 00′ S, 11° 51′ E	5 iii	2300–2315	—	SSE	17–21	SSE	4	SSE	4	0	1014·6	18·3
WS 976	From 22° 50′ S, 11° 38′ E	6 iii	0750–	*ca.* 3098 y.Gl.Oz	SE	11–16	SSE	3	SSE	4	0	1013·0	18·9
	to 22° 48′ S, 11° 35′ E		1745		SSE	11–16	S	3	S	4	bc	1010·0	20·0
WS 977	From 22° 39′ S, 12° 16′ E	6 iii–	2103–	—	SSE	11–16	SSE	3	SSE	4	0	1011·0	18·3
	to 22° 33′ S, 12° 17′ E	7 iii	0345	—	S × W	5	S × W	1	S	2	0	1013·0	18·3

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermometer	Wire angle	Temp. ° C.	S ‰	σt	Mg.-atom m.^{3}		O_2 c.c. litre	Gear	Depth (metres)	TIME		
								P inorganic	P total				From	To	
	16	0	—	—	19·6	—	—	0·38	—	—	**BT**	138–0	1020	1027	
		10	—	—	19·6	—	—	—	—	—	**N 50 V**	100–0	1021	1027	
		20	—	—	19·6	—	—	—	—	—	**SSL**	0	1028	1031	
		30	—	—	18·3										
		40	—	—	16·0										
		50	—	—	15·1										
		75	—	—	14·5										
		100	—	—	14·0										
		138	—	—	13·2										
3	16	0	—	—	20·1	—	—	0·33	—	—	**N 50 V**	100–0	1430	1445	
		10	—	—	20·1	—	—	—	—	—	**BT**	138–0	1433	1443	
		20	—	—	19·9	—	—	—	—	—	**SSL**	0	1449	1452	
		30	—	—	16·5										
		40	—	—	15·4										
		50	—	—	14·3										
		75	—	—	13·0										
		100	—	—	12·7										
		138	—	—	12·1										
4	16	0	—	—	20·1	—	—	—	—	—	**BT**	138–0	**1855**	**1900**	
		10	—	—	20·0	—	—	—	—	—	**N 50 V**	100–0	**1855**	**1900**	
		20	—	—	20·0										
		30	—	—	19·1										
		40	—	—	15·9										
		50	—	—	15·3										
		75	—	—	14·4										
		100	—	—	13·7										
		138	—	—	12·9										
5	16	0	—	—	18·7	—	—	—	—	—	**N 50 V**	100–0	**2305**	**2314**	
		10	—	—	19·0	—	—	—	—	—	**BT**	138–0	**2305**	**2315**	
		20	—	—	19·0										
		30	—	—	19·0										
		40	—	—	15·6										
		50	—	—	15·0										
		75	—	—	14·1										
		100	—	—	13·4										
		138	—	—	12·4										
6	17	0	—	—	19·31	35·32	25·20	0·58	—	5·37	**N 50 V**	100–0	0805	0813	
		10	—	—	19·31	35·24	25·14	0·58	—	—	**N 70 V**	1000–750	1001		
	17	20	—	—	19·31	35·24	25·14	0·50	—	5·39	,,	750–500			
		30	—	—	19·29	35·26	25·17	0·58	—	—	,,	500–250			
		50	—	—	19·19	35·24	25·18	0·58	—	5·26	,,	250–100			
		75	—	—	14·29	35·23	26·32	0·92	—	—	,,	100–50			
		100	—	—	13·36	35·23	26·51	1·08	—	4·18	,,	50–0	—	1220	
		150	—	—	12·14	35·05	26·61	1·25	—	—	**N 50 V**	100–0	1225	1240	
		200	—	—	11·11	34·94	26·73	1·59	—	4·21	**N 100 B**	98–0	1532	1745	KT
		300	—	—	9·20	34·67	26·85	1·68	—	3·48	**TYFB**				
		400	—	—	7·36	34·52	27·01	1·68	—	3·42	**N 100 H**	5–0	1533	1553	
		500^3	501	—	6·06	34·52	27·19	2·36	—	3·12					
		700^3	—	—	4·77	34·50	27·32	2·23	—	3·17					
		900^3	897	—	4·05	34·53	27·43	2·36	—	3·19					
		1100^2	1099	—	3·57	34·69	27·60	2·36	—	—					
		1400^2	—	—	3·34	34·70	27·64	2·10	—	3·94	—	—	—	—	Depth doubtful
		1450^2	1452	—	3·27	34·70	27·65	1·85	—	4·38	—	—	—	—	Closed prematurely
		2420^1	2424	—	2·87	34·91	27·85	1·59	—	4·64					
		2920^1	—	—	2·58	34·82	27·81	1·68	—	4·52	—	—	—	—	†Filtered from ooze
		3098^1	3098	—	2·51	34·78	27·78	2·75†	—	—	—	—	—	—	Deep hoist hit bottom
7	17	0	—	—	18·38	35·24	25·38	0·50	—	5·30	**N 50 V**	100–0	**2112**		
		10	—	—	18·38	35·27	25·41	0·58	—	—	**N 70 V**	1000–0	—	—	Failed to close
	18	20	—	—	18·37	35·27	25·41	0·50	—	5·37	,,	1000–750			
		30	—	—	15·89	35·30	26·02	1·08	—	—	,,	750–500			
		50	—	—	14·12	35·20	26·34	1·08	—	3·78	,,	500–250			

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Tem
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 977 *cont.*	From 22° 39′ S, 12° 16′ E to 22° 33′ S, 12° 17′ E	1950 6 iii– 7 iii											
WS 978	22° 28′ S, 12° 42′ E	7 iii	1000– 1304	932*	ESE	2	SE	1	SSE	1	o	1013·0	17·8
WS 979	22° 47′ S, 13° 35′ E	7 iii	1930– 2320	139*	WSW	2	—	0	—	0	o	1011·0	16·7
WS 980	22° 44′ S, 14° 08′ E	8 iii	0240– 0512	106*	Calm	0	—	1	S	1	om	1010·0	16·7
WS 981	22° 44′ S, 14° 20′ E	8 iii	0627– 0813	64*	Calm	0	—	0	S × W	1	bc	1010·0	17·8
WS 982	23° 22′ S, 14° 11′ E	9 iii	1500– 1550	124* bl.gn. Di.M	W × N	5	W × N	1	SSW	2	bc	1012·0	20·0
WS 983	23° 49′ S, 13° 57′ E	9 iii	1944– 2000	201*	Calm	0	W × N	1	SSW	2	b	1013·7	18·9
WS 984	24° 20′ S, 13° 38′ E	10 iii	0000– 0022	325*	Calm	0	—	0	SSW	2	bc	1013·7	17·8

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermometer	Wire angle	Temp. °C.	S °/₀₀	σt	Mg.-atom m.³		O₂ c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
18	75	—	—	13·22	35·17	26·50	0·88	—	—	**N 70 V**	250–100			
	100	—	—	12·68	35·06	26·52	1·25	—	3·39	,,	100–50			
	150	—	—	11·66	35·03	26·69	1·42	—	—	,,	50–0	—	**0019**	
	200	—	—	10·90	34·91	26·75	1·85	—	2·64					
	300	—	—	9·25	34·78	26·93	2·23	—	0·92					
	400	—	—	8·11	34·66	27·01	2·23	—	1·26					
	600	—	—	5·99	34·52	27·20	2·23	—	2·38					
	820^2	818	—	4·35	34·34	27·25	2·23	—	3·12					
	1490^1	1493	—	3·35	34·70	27·64	1·85	—	4·07					
18	0	—	—	18·16	35·23	25·43	0·75	—	5·16	**N 70 V**	750–500	1010		
	10	—	—	17·96	35·24	25·48	1·00	—	—	,,	500–250	—	—	Closed prematurely: hauls repeated
	20	—	—	17·92	35·25	25·49	0·88	—	3·17	,,	250–100	—	—	
	30	—	—	14·76	35·25	26·23	1·76	—	—	,,	100–50			
	50	—	—	14·29	35·22	26·32	1·76	—	5·09	,,	50–0			
	75	—	—	13·54	35·17	26·44	1·98	—	—	,,	500–350			
	100	—	—	13·08	35·16	26·51	1·98	—	2·19	**N 50 V**	100–0	—	1228	
	150	—	—	12·09	35·06	26·63	2·55							
	200	—	—	10·95	34·80	26·65	1·85	—	2·85					
	300	—	—	9·38	34·69	26·83	1·85	—	1·89					
	400	—	—	7·94	34·61	27·01	2·10	—	1·46					
	600^1	604	—	5·70	34·45	27·17	2·75	—	2·31					
	820^1	824	—	4·22	34·46	27·35	2·81	—	3·21					
18	0	—	—	16·68	35·12	25·70	0·20	—	8·07	**OTC**	146	**1930**	**2210**	Trawl fouled medusae and amphipods
	10	—	—	16·17	35·13	25·82	0·33	—	—	**NH**	0-	**2205**		
	20	—	—	15·31	35·10	26·00	0·33	—	4·78	**N 50 V**	100–0	**2225**		
	30	—	—	13·66	35·16	26·39	1·68	—	—	**N 70 V**	50–0			
	50	—	—	13·08	35·10	26·47	0·92	—	2·21	,,	100–50	—	**2255**	
	75	—	—	12·63	35·10	26·56	1·08							
	100	—	—	12·43	35·09	26·59	1·85	—	1·19					
19	0	—	—	16·97	35·15	25·66	0·25	—	6·43	**N 70 V**	100–50	**0255**		
	10	—	—	15·42	35·14	26·00	2·49	—	—	,,	50–0			
	20	—	—	14·32	35·15	26·25	2·75	—	2·56	**N 50 V**	100–0	—	**0325**	
	30	—	—	13·32	35·13	26·44	2·49	—	—	**LH**	*ca.* 5	—	**0300**	
	50	—	—	13·15	35·17	26·52	3·01	—	0·13					
	75	—	—	12·91	35·15	26·55	2·61							
	100	—	—	12·70	35·10	26·55	2·61	—	0·38					
19	0	—	—	16·69	35·15	25·72	1·42	—	0·33	**N 70 V**	50–0	0635		
	10	—	—	14·92	35·13	26·11	1·68	—	—	**N 50 V**	55–0	—	0701	
	20	—	—	13·52	35·10	26·38	2·10	—	0·88	**N 100 H**	5–0	0753	0813	
	30	—	—	13·41	35·11	26·42	2·88							
	50	—	—	13·34	35·10	26·42	2·95	—	0·11					
20	0	—	—	16·6	—	—	—	—	—	**DC**	124	1510	1525	GMT = zone − 2 hrs
	10	—	—	15·5	—	—	—	—	—	**BT**	120–0	1535	1540	
	20	—	—	14·2	—	—	—	—	—	**N 50 V**	100–0	1540	1550	Khaki-coloured water
	30	—	—	13·8										
	50	—	—	13·1										
	75	—	—	12·8										
	100	—	—	12·6										
	120	—	—	12·5										
20	0	—	—	18·4	—	—	—	—	—	**N 50 V**	100–0	**1950**	**2000**	
	10	—	—	16·5	—	—	—	—	—	**BT**	138–0	**1953**	**2000**	
	20	—	—	15·1										
	30	—	—	14·0										
	50	—	—	13·2										
	75	—	—	12·6										
	100	—	—	12·2										
	138	—	—	11·9										
21	0	—	—	17·0	—	—	—	—	—	**N 50 V**	100–0	**0010**	**0020**	
	10	—	—	16·3	—	—	—	—	—	**BT**	138–0	**0015**	**0022**	

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Ter
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 984 *cont.*	24° 20′ S, 13° 38′ E	1950 10 iii											
WS 985	24° 50′ S, 13° 20′ E	10 iii	0422–0438	768*	W×S	5	—	0	SSW	2	b	1015·5	17·2
WS 986	From 25° 15′ S, 13° 06′ E	10 iii	0805–	—	Calm	0	—	0	SSW	2	b	1016·4	17·2
	to 25° 13′ S, 13° 08′ E		1407	—	Calm	0	—	0	SSW	2	b	1016·0	20·0
WS 987	25° 13′ S, 13° 43′ E	10 iii	1810–2000	293*	Calm	0	—	0	SSW	2	b	1015·9	20·0
WS 988	25° 12′ S, 14° 22′ E	11 iii	0026–0132	135*	S	7–10	S	1	S	1	b	1014·0	16·7
WS 989	25° 11′ S, 14° 39′ E	11 iii	0247–0345	70*	SSW	7–10	SSW	2	S	1	b	1013·5	16·7
WS 990	From 25° 35′ S, 14° 27′ E to 25° 36′ S, 14° 24′ E	11 iii	0855–1228	143* gn.-bl. c.M & Sh	SSW	11–16	SSW	2	SSW	1	bc	1013·5	16·7

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermo-meter	Wire angle	Temp. °C.	S °/₀₀	σt	Mg.-atom m.³		O₂ c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
21	20	—	—	15·4										
	50	—	—	14·4										
	60	—	—	13·4										
	75	—	—	13·0										
	100	—	—	12·4										
	138	—	—	11·6										
21	0	—	—	16·8	—	—	—	—	—	**N 50 V**	100–0	**0425**	**0438**	
	10	—	—	15·7	—	—	—	—	—	**BT**	138–0	**0433**	**0438**	
	20	—	—	15·5										
	30	—	—	15·1										
	40	—	—	14·0										
	50	—	—	13·4										
	75	—	—	12·8										
	100	—	—	12·3										
	138	—	—	11·7										
21	0	—	—	17·10	35·00	25·51	1·08	—	5·92	**N 50 V**	100–0	0825		
	10	—	—	16·34	34·97	25·67	1·42	—	—	**N 70 V**	1000–750			
21	20	—	—	16·29	34·99	25·69	1·21	—	5·88	,,	750–500			
	30	—	—	15·87	35·00	25·80	1·08	—	—	,,	500–250			
	50	—	—	14·70	35·05	26·09	1·42	—	4·56	,,	250–100			
	75	—	—	13·24	34·99	26·36	1·51	—	—	,,	100–50			
	100	—	—	12·26	34·92	26·49	1·34	—	4·05	,,	50–0	—	1118	
	150	—	—	11·61	34·93	26·63	1·25	—	—	**NH**	0			
	200	—	—	10·84	34·88	26·73	1·68	—	2·53					
	300	—	—	9·44	34·74	26·87	2·10	—	1·49					
	400	—	—	7·72	34·58	27·01	2·10	—	2·45					
	610^3	607	—	5·75	34·43	27·16	2·61	—	2·43					
	800^3	—	—	4·34	34·38	27·28	2·61	—	2·77					
	1010^2	1006	—	3·52	34·41	27·39	2·61	—	3·79					
	1200^1	1200	—	3·19	34·58	27·56	2·10	—	3·99					
	1500^2	—	—	3·23	34·74	27·68	1·68	—	4·06					
21	0	—	—	15·71	34·97	25·82	1·76	—	5·99	**N 70 V**	100–50	1822		
	10	—	—	15·47	35·00	25·89	1·76	—	—	,,	250–100			
	20	—	—	15·20	35·03	25·97	1·51	—	1·26	,,	50–0			
	30	—	—	15·04	35·00	25·98	1·25	—	—	**N 50 V**	100–0	—	**1955**	
	50	—	—	14·52	34·93	26·04	1·51	—	5·10					
	75	—	—	13·97	35·02	26·23	2·92							
	100	—	—	12·75	34·96	26·43	1·68	—	3·59	—	—	—	—	Large stray below 100 m.
	150	—	—	11·71	34·95	26·63	1·59							
	200	—	—	11·11	34·92	26·71	2·10	—	0·80					
22	0	—	—	16·26	35·06	25·75	1·08	—	7·89	**N 70 V**	50–0	**0035**		
	10	—	—	14·61	35·07	26·12	1·68	—	—	,,	100–50			
	20	—	—	13·75	35·06	26·30	> 3·50	—	3·61	**N 50 V**	100–0	—	**0115**	P?
	30	—	—	13·34	35·04	26·37	2·36							
	50	—	—	12·25	35·04	26·59	1·42	—	1·48					
	75	—	—	12·07	35·00	26·60	2·49							
	100	—	—	11·92	35·00	26·62	2·49	—	0·34					
	125	—	—	11·80	35·00	26·65	2·88	—	0·25					
22	0	—	—	14·82	35·03	26·05	1·42	—	7·06	**N 50 V**	50–0	**0303**		
	10	—	—	14·15	35·03	26·20	1·51	—	—	**N 70 V**	50–0	—	**0322**	
	20	—	—	13·08	35·03	26·42	1·98	—	2·05					
	30	—	—	12·76	35·03	26·48	2·92							
	50	—	—	12·66	35·02	26·50	2·95	—	0·22					
	60	—	—	12·64	35·05	26·51	2·92	—	0·29					
22	0	—	—	14·9	—	—	—	—	—	**DC**	128	0905	0915	
	10	—	—	14·7	—	—	—	—	—	**BT**	131–0	0920	0930	
	20	—	—	13·8	—	—	—	—	—	**N 50 V**	100–0	0930	0940	
	30	—	—	13·6	—	—	—	—	—	**OTC**	153–	1000	1228	
	40	—	—	12·7										
	50	—	—	12·6										

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Te
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 990 *cont.*	From 25° 35′ S, 14° 27′ E to 25° 36′ S, 14° 24′ E	1950 11 iii											
WS 991	26° 08′ S, 14° 14′ E	11 iii	1635–1652	232*	S	7–10	SSW	2	SSW	2	bc	1014·4	17·8
WS 992	26° 35′ S, 14° 03′ E	11 iii	2052–2110	398*	S	17–21	S	3	SSW	2	b	1011·0	18·3
WS 993	27° 03′ S, 13° 55′ E	12 iii	0117–0150	871*	S	11–16	S	3	S	2	b	1013·0	20·0
WS 994	27° 31′ S, 13° 42′ E	12 iii	0555–0615	—	S × E	11–21	S	3	S	3	b	1011·7	17·2
WS 995	28° 02′ S, 13° 37′ E	12 iii	1015–1030	—	S	7–10	S	2	S	3	b	1013·0	20·0
WS 996	From 28° 41′ S, 13° 25′ E	12 iii	1551–	—	SSE	11–21	SSE	3	S	1	b	1013·0	20·0
	to 28° 39′ S, 13° 23′ E		1955	—	SE	7–10	SE	2	SSE	1	bc	1013·0	20·6

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermometer	Wire angle	Temp. °C.	S ‰	σt	Mg.-atom m.³ P inorganic	Mg.-atom m.³ P total	O_2 c.c. litre	Gear	Depth (metres)	TIME From	TIME To	
)	22	75	—	—	12·1										
		100	—	—	11·7										
		131	—	—	11·5										
1	22	0	—	—	15·4	—	—	—	—	—	N 50 V	100–0	1645	1652	
		10	—	—	14·9	—	—	—	—	—	BT	138–0	1646	1652	
		20	—	—	14·1										
		30	—	—	13·7										
		50	—	—	13·2										
		75	—	—	12·9										
		100	—	—	12·2										
		138	—	—	11·2										
2	22	0	—	—	16·4	—	—	—	—	—	BT	138–0	**2100**	**2110**	
		10	—	—	16·0	—	—	—	—	—	N 50 V	100–0	**2102**	**2110**	
		20	—	—	15·0										
		30	—	—	14·9										
		50	—	—	14·2										
		75	—	—	13·5										
		100	—	—	13·0										
		138	—	—	12·3										
3	23	0	—	—	20·5	—	—	—	—	—	BT	138–0	**0125**	**0135**	
		20	—	—	20·5	—	—	—	—	—	N 50 V	100–0	**0138**	**0145**	
		30	—	—	20·3										
		40	—	—	20·0										
		50	—	—	17·7										
		60	—	—	16·2										
		70	—	—	15·1										
		80	—	—	15·0										
		100	—	—	13·6										
		138	—	—	12·8										
4	23	0	—	—	20·3	—	—	—	—	—	BT	138–0	**0600**	**0610**	
		40	—	—	20·0	—	—	—	—	—	N 50 V	100–0	**0602**	**0610**	
		75	—	—	17·7										
		90	—	—	17·0										
		100	—	—	15·9										
		138	—	—	13·3										
5	23	0	—	—	18·4	—	—	—	—	—	BT	138–0	1020	1030	
		10	—	—	17·3	—	—	—	—	—	N 50 V	100–0	1020	1030	
		20	—	—	16·7										
		30	—	—	16·6										
		50	—	—	16·4										
		75	—	—	13·8										
		100	—	—	12·3										
		138	—	—	11·9										
96	23	0	—	—	20·38	35·18	24·82	0·00	—	5·50	N 50 V	100–0	1555	1605	
		10	—	—	20·38	35·17	24·82	0·00	—	—	N 70 V	1000–0	1610	—	Net failed to close
	23	20	—	—	19·77	35·18	24·99	0·09	—	5·47	,,	1000–750			
		30	—	—	19·53	35·18	25·05	0·09	—	—	,,	750–500			
		50	—	—	18·58	35·18	25·29	0·08	—	5·67	,,	500–250			
		75	—	—	15·76	35·20	25·50	0·33	—	—	,,	250–100			
		100	—	—	14·11	35·15	26·30	0·25	—	4·87	,,	100–50			
		150	—	—	12·13	34·96	26·55	0·75	—	—	,,	50–0	—	1858	
		200	—	—	11·18	34·86	26·65	0·92	—	4·34					
		300	—	—	9·54	34·69	26·80	—	—	4·75					
		400	—	—	8·04	34·65	27·01	1·42	—	4·56					
		600^2	602	—	4·99	34·34	27·18	1·68	—	4·53					
		800^2	—	—	4·14	34·39	27·31	1·85	—	3·26					
		1000^2	1000	—	3·40	34·45	27·43	1·51	—	3·75					
		1170^1	1169	—	3·01	34·53	27·53	2·10	—	4·13					
		1470^1	—	—	3·05	34·70	27·67	1·68	—	4·17					
		2000^1	1995	—	3·01	34·80	27·75	1·38	—	4·52					

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 997	From 28° 40′ S, 14° 06′ E	1950 13 iii	0030–	1075*	SE	7–10	S	2	S	1	bc	1014·0	19·4
	to 28° 37′ S, 14° 08′ E		0416	983*	S	7–10	S	2	S	1	bc	1014·0	—
WS 998	28° 40′ S, 14° 43′ E	13 iii	0804– 0930	198*	S×E	7–10	S	2	S	1	bc	1013·8	18·9
WS 999	From 28° 38′ S, 14° 59′ E	13 iii	1120–	171* br.S	S×E	7–10	S	2	S	1	o	1014·6	18·3
	to 28° 31′ S, 15° 00′ E		1543	—	S×E	7–10	SSE	2	SSE	1	o	1015·0	18·9
WS 1000	28° 40′ S, 15° 29′ E	13 iii	1934– 2040	188*	S×E	7–10	SSE	2	SSE	1	o	1014·6	18·9
WS 1001	28° 40′ S, 15° 56′ E	13–14 iii	2355– 0158	121*	SSW	2	S	2	S	1	o	1015·3	17·8
WS 1002	28° 40′ S, 16° 14′ E	14 iii	0253– 0343	69*	Lt airs	—	—	0	SE	1	o	1017·5	17·2
WS 1003	33° 12′ S, 27° 46′ E	2 v	0815– 1400	80* S.Sh	ESE	5	ESE	2	Sly.	2	od	1026·0	16·1
WS 1004	33° 15′ S, 27° 48′ E	2 v	1700– 1723	93*	ESE	7–10	ESE	2	SE	2	od	1024·0	17·2
	33° 16′ S, 27° 47′ E	3 v	0612– 0957	90*	ENE	17–27	SE	3	SE	4	o	1014·0	19·4
	33° 15′ S, 27° 48′ E	4 v	0955– 1225	93*	SW	11–16	SW	4	SW	4	bc	1015·0	17·8

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermo-meter	Wire angle	Temp. ° C.	S ‰	σ_t	Mg.-atom m.^{3} P inorganic	Mg.-atom m.^{3} P total	O_2 c.c. litre	Gear	Depth (metres)	TIME From	TIME To	
	24	0	—	—	20·18	35·20	24·89	<0·04	—	4·97	**N 70 V**	1000–0	**0105**	—	Net failed to close
		10	—	—	20·16	35·19	24·88	0·20	—	—	,,	1000–750			
	24	20	—	—	19·39	35·20	25·09	0·29	—	5·35	,,	750–500			
		30	—	—	18·79	35·21	25·26	0·50	—	—	,,	500–250			
		50	—	—	15·71	35·21	26·00	0·50	—	5·15	,,	250–100			
		75	—	—	14·19	35·04	26·20	0·92	—	—	,,	100–50			
		100	—	—	12·83	35·03	26·47	0·67	—	4·98	,,	50–0			
		150	—	—	12·12	34·91	26·52	0·83	—	—	,,	250–0	—	—	Net failed to close
		200	—	—	11·18	34·84	26·64	0·92	—	4·87	**N 50 V**	100–0	—	**0410**	
		300	—	—	9·06	34·63	26·84	1·85	—	4·43					
		400	—	—	7·54	34·61	27·06	1·68	—	3·97					
		570[1]	571	—	5·17	34·31	27·13	2·49	—	4·00					
		780[1]	—	—	4·00	34·34	27·29	2·36	—	3·50					
		880[1]	877	—	3·59	34·46	27·42	2·23	—	3·71					
	24	0	—	—	18·36	35·01	25·21	0·50	—	5·64	**N 50 V**	100–0	0810		
		10	—	—	18·35	35·01	25·22	0·42	—	—	**N 70 V**	175–100			
		20	—	—	18·33	35·00	25·21	0·42	—	5·72	,,	100–50			
		30	—	—	16·17	34·98	25·72	0·67	—	—	,,	50–0	—	0850	
		50	—	—	14·05	35·03	26·22	0·67	—	4·75					
		75	—	—	12·28	35·01	26·57	1·08							
		100	—	—	11·62	34·94	26·63	1·08	—	4·84					
		150	—	—	10·21	34·84	26·81	1·08	—	4·13					
		175	—	—	9·53	34·76	26·86	1·98	—	3·59					
	24	0	—	—	18·22	35·00	25·24	0·42	—	5·72	**N 70 V**	150–100	1125		
		10	—	—	18·20	34·91	25·18	0·83	—	—	,,	100–50			
	24	20	—	—	17·23	34·88	25·38	0·50	—	5·77	,,	50–0			
		30	—	—	15·20	35·03	25·97	0·50	—	—	**N 50 V**	100–0	—	1200	
		50	—	—	14·00	35·01	26·22	0·67	—	4·70	**DC**	172	1305	1340	
		75	—	—	11·05	34·84	26·66	0·92	—	—	**OTC**	172–	1350	1540	
		100	—	—	10·59	34·85	26·75	1·42	—	4·16					
		150	—	—	9·48	34·76	26·87	2·49	—	3·47					
00	24	0	—	—	18·00	34·89	25·21	0·50	—	5·84	**N 70 V**	150–100	**1940**		
		10	—	—	18·00	34·86	25·18	0·50	—	—	,,	100–50			
		20	—	—	17·95	34·82	25·17	0·50	—	5·91	,,	50–0			
		30	—	—	16·08	34·86	25·64	0·75	—	—	**N 50 V**	100–0	—	**2030**	
		50	—	—	11·09	34·87	26·68	1·59	—	3·90					
		75	—	—	10·12	34·76	26·76	1·51							
		100	—	—	9·39	34·61	26·78	1·68	—	3·83					
		150	—	—	8·91	34·61	26·86	2·10	—	2·24					
01	24–25	0	—	—	17·14	32·39	23·51	0·50	—	7·01	**N 70 V**	100–50	**0005**		
		10	—	—	16·46	34·62	25·38	0·33	—	—	,,	50–0			
		20	—	—	13·26	34·87	26·26	1·98	—	4·14	**N 50 V**	100–0	—	**0140**	
		30	—	—	11·65	34·88	26·58	1·08							
		50	—	—	11·01	34·86	26·68	1·17	—	4·17					
		75	—	—	10·28	34·76	26·73	1·59							
		100	—	—	10·07	34·69	26·71	2·75	—	0·88					
02	25	0	—	—	14·23	33·64	25·11	0·92	—	6·74	**N 50 V**	60–0	**0302**		
		10	—	—	11·92	34·57	26·29	1·85	—	—	**N 70 V**	50–0	—	**0330**	
		20	—	—	11·04	34·66	26·52	1·34	—	4·07					
		30	—	—	10·43	34·76	26·71	1·85							
		50	—	—	10·08	34·76	26·77	2·49	—	1·70					
03	15	—	—	—	—	—	—	—	—	—	**DC**	80	0745	0758	
											OTC	80	0810	1400	
04	15	—	—	—	—	—	—	—	—	—	**LL**	93	1705/2	**0612/3**	Unable to haul either line
	16	—	—	—	—	—	—	—	—	—	—	—	0730/3	0957/3	1st line hauled
	17	—	—	—	—	—	—	—	—	—	—	—	1020/4	1225/4	2nd line hauled

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Ten
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1005	33° 17′ S, 27° 40′ E (centre position)	1950 5 v	0800– 1540	84* 73*	W Wly	22–27 17–27	WSW WSW	4 4	WSW WSW	4–5 4	b bc	1027·0 1029·0	17·8 18·9
WS 1006	33° 14′ S, 27° 36′ E	6–7 v	0920/6 1330/6 0930/7	37* — —	SW × W SW × W NE	17–21 17–21 5	SW × W SW × W WSW	3 3 2	SW SW SW	5 5 4	bc b b	1029·0 1030·0 1030·0	18·3 20·0 18·3
WS 1007	33° 26′ S, 27° 42′ E	7 v	1210– 1400	232*	WSW	5	WSW	1	SW	4	b	1031·0	20·0
WS 1008	33° 35′ S, 27° 30′ E	7 v	1610– 1720	143*	ENE	5	SW	2	SW	3–4	b	1027·0	22·2
WS 1009	33° 18′ S, 27° 55′ E	8 v	0825– 0853	164*	NNE	5	NNE	2	SSW	5	bc	1027·0	20·6
WS 1010	33° 18′ S, 27° 51′ E	9 v	0740– 0905	260*	NNE	7–10	NNE	2	SSW	4	o	1022·0	21·7
WS 1011	From 33° 19′ S, 27° 46′ E to 33° 28′ S, 27° 34′ E	9 v	1018– 1820	106* br.c.S. Sh	NE × E	11–16	NE × E	2	NE	1	bc	1018·0	21·7
WS 1012	33° 20′ S, 27° 35′ E	10 v	1245– 1407	82*	Calm	0	—	—	E	2	b	1021·0	18·9
WS 1013	20° 29′ S, 57° 14′ E	27 vi	1804– 1816	212*	SE	7–10	SE	2	SE	3	c	1019·0	22·8
WS 1014	20° 38′ S, 57° 52′ E	27 vi	2345– 2359	—	ESE	4–6	E	2	SE	2	b	1019·0	22·8
WS 1015	21° 11′ S, 60° 43′ E	28 vi	2000– 2030	—	NNE	4–6	NE	2	NE	5	bc	1021·6	22·8
WS 1016	21° 41′ S, 64° 10′ E	29 vi	2000– 2015	—	S × E	4–6	E	1	NE	2	bc	1021·6	22·2
WS 1017	From 22° 18′ S, 67° 29′ E to 22° 23′ S, 67° 26′ E	30 vi– 1 vii	2000– 0520	3542 y.Gl.Oz	ESE	11–16	SW	1	SW	4	bc	1026·8	22·8

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermometer	Wire angle	Temp. °C.	S ‰	σt	Mg.-atom m.^{3}		O_2 c.c. litre	Gear	Depth (metres)	TIME		
								P inorganic	P total				From	To	
5	18	—	—	—	—	—	—	—	—	—	**OTC**	86	0800	0915	Warps fouled, no catch
	18	—	—	—	—	—	—	—	—	—	,,	84	1150	1540	
6	19	—	—	—	—	—	—	—	—	—	**LL**	37	0920/6	1617/6	
	19	—	—	—	—	—	—	—	—	—	**TNL**	48	1045/6	1715/6	With bait
	20	—	—	—	—	—	—	—	—	—	,,	33	1720/6	0930/7	With bait + under-water lamp
7	20	—	—	—	—	—	—	—	—	—	**OTC**	232	1207	1355	Hauled with difficulty—v. strong current
8	20	—	—	—	—	—	—	—	—	—	**TNL**	143	1634	—	**TNL** lost—v. strong current
9	21	—	—	—	—	—	—	—	—	—	**LL**	165–128	0825	—	**LL** lost—v. strong current
0	22	—	—	—	—	—	—	—	—	—	**LS**	263–1320	0741	0905	
1	22	—	—	—	—	—	—	—	—	—	**DC**	106	1039	1104	
											OTC	102	1110	1340	Trawl fouled, not fishing properly
											,,	110	1710	**1820**	Trawl fouled, no catch
12	23	—	—	—	—	—	—	—	—	—	**OTC**	73	1235	1405	Trawl extensively damaged
13	11	0	—	—	24·0	—	—	—	—	—	**BT**	138–0	**1809**	**1815**	GMT = zone − 4 hrs
		30	—	—	24·0										
		50	—	—	23·4										
		75	—	—	23·2										
		100	—	—	21·7										
		138	—	—	19·6										
14	11	0	—	—	23·1	—	—	—	—	—	**BT**	138–0	**2354**	**2359**	
		10	—	—	23·1										
		20	—	—	23·1										
		30	—	—	23·1										
		50	—	—	23·1										
		75	—	—	22·8										
		100	—	—	21·6										
		138	—	—	19·9										
15	12	0	—	—	23·6	—	—	—	—	—	**BT**	138–0	**2006**	**2014**	
		10	—	—	23·6	—	—	—	—	—	**N 50 V**	100–0	**2020**	**2026**	
		20	—	—	23·5										
		30	—	—	23·4										
		50	—	—	23·2										
		75	—	—	22·9										
		100	—	—	22·0										
		138	—	—	19·6										
16	13	0	—	—	22·8	—	—	—	—	—	**BT**	138–0	**2002**	**2009**	
		10	—	—	22·7	—	—	—	—	—	**N 50 V**	100–0	**2002**	**2010**	
		20	—	—	22·6										
		30	—	—	22·6										
		50	—	—	22·5										
		75	—	—	22·1										
		100	—	—	19·7										
		138	—	—	18·1										
17	14	0	—	—	23·34	35·17	23·99	0·25	—	4·89	**N 50 V**	100–0	**2151**	—	Great stray on wires; deep catch discarded
		10	—	—	23·34	35·15	23·97	0·17	—	—	**N 70 V**	1000–750	—	—	
		20	—	—	23·33	35·17	23·99	0·17	—	4·91	,,	50–0	—	**2320**	
		30	—	—	23·16	35·26	24·11	0·17							
		50	—	—	23·00	35·38	24·25	0·25	—	4·87					
		75	—	—	22·29	35·47	24·52	0·17							

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Tem
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1017 *cont.*	From 22° 18′ S, 67° 29′ E to 22° 23′ S, 67° 26′ E	1950 30 vi–1 vii											
WS 1018	22° 51′ S, 68° 46′ E	1 vii	2000–2030	—	ESE	17–21	E	3	E	5	ce	1027·0	21·7
WS 1019	23° 15′ S, 70° 51′ E	2 vii	2004–2028	—	SE × S	17–27	SE	4	SE	5	bc	1024·0	20·6
WS 1020	25° 16′ S, 72° 55′ E	7 vii	2000–2013	—	SE × S	11–16	SE	3	SE	5	b	1022·0	18·9
WS 1021	20° 16·5′ S, 57° 21·5′ E Fringing Reef, Flic en Flacq, Mauritius	16 vii	0645–0830	—	Calm	0	SW	1	—	0	b	1022·0	21·1
WS 1022	From 25° 26′ S, 46° 07′ E to 25° 27′ S, 46° 10′ E	27 vii	1853–2156	58* S.Sh	NE	11–16	NE	2	NE	5	bc	1023·0	21·1
WS 1023	25° 56′ S, 45° 29′ E	28 vii	1904–2201	77* y.br.S	S × W	11–16	ESE	3	SE	3	cp	1022·0	20·6
WS 1024	23° 25′ S, 43° 34′ E	31 vii	2140–2155	—	SW	5	SW	2	SW	3	bc	1021·7	21·7
WS 1025	22° 40′ S, 41° 39′ E	1–2 viii	1930–0424	3235 gy.br. Gl.Oz	S × W	17–21	SW	2	SSW	3	c	1021·7	22·2

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermo-meter	Wire angle	Temp. ° C.	S °/₀₀	σt	Mg.-atom m.³		O₂ c.c. litre	Gear	Depth (metres)	TIME		
								P inorganic	P total				From	To	
7	14	100	—	—	21·93	35·46	24·61	0·50	—	4·80					
		150	—	—	21·96	35·36	24·52	0·17							
		200	—	—	20·97	35·51	24·91	0·20	—	4·58					
		300	—	—	15·16	35·49	26·33	0·50	—	4·93					
		400	—	—	12·77	35·21	26·62	0·67	—	5·25					
		580^1	579	—	10·64	34·85	26·74	1·00	—	4·96					
		970^1	—	—	5·70	34·42	27·14	1·98	—	3·58					
		1320^2	—	—	3·58	34·50	27·45	2·10	—	2·69					
		1360^1	1363	—	3·54	34·59	27·53	2·23	—	2·83					
		1800^2	1799	—	2·43	34·64	27·67	2·23	—	3·20					
8	15	0	—	—	22·1	—	—	—	—	—	**BT**	138–0	**2006**	**2013**	
		10	—	—	22·1	—	—	—	—	—	**N 50 V**	100–0	**2018**	**2024**	
		20	—	—	22·1										
		30	—	—	22·1										
		50	—	—	22·2										
		75	—	—	22·1										
		100	—	—	22·0										
		138	—	—	21·8										
9	16	0	—	—	22·1	—	—	—	—	—	**BT**	138–0	**2009**	**2015**	GMT = zone − 5 hrs
		10	—	—	22·1	—	—	—	—	—	**N 50 V**	100–0	**2015**	**2022**	
		20	—	—	22·2										
		30	—	—	22·2										
		50	—	—	21·9										
		75	—	—	21·7										
		100	—	—	20·1										
		138	—	—	18·7										
0	21	0	—	—	21·5	—	—	—	—	—	**BT**	138–0	**2007**	**2013**	
		10	—	—	21·6										
		20	—	—	21·6										
		30	—	—	21·6										
		50	—	—	21·6										
		75	—	—	21·5										
		100	—	—	21·4										
		138	—	—	19·3										
1	1	—	—	—	—	—	—	—	—	—	**Sh. Coll.**	—	0645	0830	Fringing coral reef on volcanic substrate. GMT = zone − 4 hrs
2	11	—	—	—	—	—	—	—	—	—	**DC**	58	**1855**	**1906**	GMT = zone − 3 hrs
											DLH	66	**1915**	**1937**	
											OTC	66	**2000**	**2030**	Trawl fouled, re-[peated
											,,	66	**2030**	**2156**	
3	12	—	—	—	—	—	—	—	—	—	**DC**	77	**1925**	**1933**	No sample, dredge [repeated
											,,	77	**1934**	**1942**	
											DLH	77	**1952**	**2016**	
											OTC	77	**2035**	**2201**	
4	16	0	—	—	23·2	—	—	—	—	—	**N 50 V**	100–0	**2145**	**2152**	
		10	—	—	23·2	—	—	—	—	—	**BT**	135–0	**2146**	**2152**	
		20	—	—	23·2										
		30	—	—	23·2										
		50	—	—	23·0										
		75	—	—	22·2										
		100	—	—	21·8										
		135	—	—	19·5										
25	17–18	0	—	2·5°	23·62	35·40	24·08	0·00	—	4·93	**N 50 V**	100–0	**2112**	**2119**	
		10	—	10°	23·62	35·28	23·98	0·04	—	—	**N 70 V**	1000–750	**2136**		
		20	—	15°	23·61	35·31	24·01	0·04	—	5·40	,,	750–500	—	—	Haul repeated
		30	—	15°	23·61	35·24	23·96	0·04	—	—	,,	750–500			
		50	—	20°	23·54	35·24	23·98	0·09	—	4·87	,,	500–250			

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Te
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1025 *cont.*	22° 40′ S, 41° 39′ E	1950 1–2 viii											
WS 1026	22° 00′ S, 40° 10′ E	2–3 viii	2015–0457	1763?	SE × S	11–16	SSE	2	SSE	3	b	1025·0	22·2
WS 1027	21° 05′ S, 37° 50′ E	3–4 viii	2330–0640	2957	S	7–10	S	2	SSE	2	b	1023·0	22·2
WS 1028	20° 42′ S, 37° 03′ E	4 viii	1107–1135	—	SE	22–27	SE	4	SSE	4	bc	1026·0	23·3
WS 1029	20° 29′ S, 36° 30′ E	4 viii	1505–1513	—	SE	24	SE	4	SSE	4	bc	1026·0	23·3

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermometer	Wire angle	Temp. °C.	S ‰	σt	Mg.-atom m.³		O_2 c.c. litre	Gear	Depth (metres)	TIME		
								P inorganic	P total				From	To	
5	17–18	75	—	25°	22·32	35·26	24·35	0·29	—	—	**N 70 V**	250–100			
		100	—	30°	20·52	35·26	24·84	0·50	—	3·66	,,	100–50			
		150	—	30°	18·06	35·34	25·54	0·50	—	—	,,	50–0	—	**0015**	
		200	—	35°	16·40	35·35	25·94	0·50	—	3·97	**NH**	0			
		300	—	35°	13·82	35·27	26·46	0·58	—	4·71	**N 70 B**	174–0	**0346**	**0404**	KT
		400	—	35°	12·66	35·15	26·60	0·67	—	4·80	**N 100 B**				
		600	—	40°	10·84	34·93	26·77	1·00	—	4·90	**N 100 H**	5–0	**0352**	**0404**	
		750^2	747	40°	8·35	34·70	27·01	1·51	—	3·36					
		950^2	—		6·64	34·70	27·26	1·85	—	2·43					
		1470^2	1465		4·43	34·72	27·54	2·10	—	2·19					
		1820^1	1821	40°	3·07	34·70	27·67	2·10	—	3·09					
		2300^1	—		2·52	34·71	27·73	2·10	—	3·63					
		2780^1	2781		2·21	34·74	27·77	3·14	—	3·81					
6	18–19	0	—	0°	24·51	35·13	23·61	—	—	4·74	**N 50 V**	100–0	**2149**	**2201**	No sample in Baillie rod
		10	—	5°	24·52	35·11	23·60	0·04	—	—	**N 70 V**	1000–750	**2207**		
		20	—	5°	24·52	35·12	23·60	0·04	—	4·76	,,	750–500			
		30	—	5°	24·51	35·11	23·60	0·09	—	—	,,	500–250	—	**2336**	Net lost
		50	—	5°	24·50	35·16	23·63	0·09	—	4·75	,,	250–100	**0306**		
		75	—	15°	24·49	35·15	23·63	0·09	—	—	,,	100–50			
		100	—	25°	24·47	35·19	23·66	0·42	—	4·78	,,	50–0	—	**0337**	
		150	—	20°	21·11	35·21	24·65	0·42	—	—	,,	500–250	**0342**	**0400**	
		200	—	25°	17·77	35·34	25·61	0·50	—	3·39	**N 100 B**	201–0	**0437**	**0452**	KT
		300	—	30°	14·54	35·26	26·29	0·58	—	4·00	**N 100 H**	5–0	**0439**	**0457**	
		400	—	25°	12·74	35·16	26·58	0·50	—	5·01					
		600	—	30°	9·75	34·77	26·83	0·92	—	4·88					
		1020^1	1023	30°	5·97	34·65	27·30	1·98	—	2·22					
		1220^1	—		5·33	34·69	27·40	1·98	—	1·79					
		1520^1	1516		3·94	34·69	27·56	1·98	—	2·07					
27	19–20	0	—	5°	23·14	35·27	24·12	0·00	—	4·87	**N 50 V**	100–0	**0021**	**0028**	Lucas wire parted [on hauling
		10	—	5°	23·15	35·26	24·11	0·00	—	—	**N 70 V**	1000–0	**0047**	—	Failed to close
		20	—	8°	23·16	35·25	24·09	0·13	—	4·80	,,	1000–750			
		30	—	10°	23·14	35·28	24·12	0·13	—	—	,,	750–500	—	—	Depth doubtful, [repeated
		50	—	10°	22·03	35·25	24·13	0·20	—	4·03	,,	750–500			
		75	—	15°	20·84	35·30	24·79	0·20	—	—	,,	500–250			
		100	—	15°	19·73	35·34	25·11	0·45	—	3·64	,,	250–100			
		150	—	15°	17·22	35·37	25·77	0·42	—	—	,,	100–50			
		200	—	25°	15·76	35·37	26·11	0·42	—	4·03	,,	50–0	—	—	Machine stopped while hauling; [repeated
		300	—	20°	13·38	35·26	26·54	0·50	—	4·83	,,	50–0	—	**0450**	
		400	—	22°	12·00	35·05	26·64	0·50	—	4·75	**N 100 B**	110–0	**0613**	**0635**	KT
		600	—	—	9·69	34·79	26·86	1·17	—	4·70	**N 70 B**				
		740^2	744	37°	7·98	34·65	27·02	1·34	—	4·32	**N 100 H**	5–0	**0614**	**0637**	
		940^2	—		6·56	34·63	27·21	1·85	—	2·09					
		1130^2	1130		5·58	34·72	27·40	2·10	—	1·75					
		1330^1	1325	35°	4·23	34·69	27·53	2·10	—	2·30					
		1800^1	—		2·74	34·68	27·68	1·68	—	3·26					
		2290^1	2293		2·33	34·74	27·76	1·68	—	3·96					
28	20	0	—	—	23·4	—	—	—	—	—	**BT**	126–0	1106	1111	
		10	—	—	23·4	—	—	—	—	—	**N 50 V**	100–0	1115	1120	Haul interrupted, [repeated
		20	—	—	23·4	—	—	—	—	—	,,	100–0	1128	1132	
		30	—	—	23·4										
		50	—	—	23·4										
		61	—	—	23·3										
		75	—	—	22·4										
		100	—	—	19·8										
		126	—	—	18·8										
29	20	0	—	—	23·8	—	—	—	—	—	**N 50 V**	100–0	1505	1512	
		10	—	—	23·8	—	—	—	—	—	**BT**	130–0	1506	1513	
		20	—	—	23·8										
		30	—	—	23·8										
		50	—	—	23·8										
		70	—	—	23·8										
		75	—	—	22·9										

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Tem
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1029 *cont.*	20° 29′ S, 36° 30′ E	1950 4 viii											
WS 1030	20° 17′ S, 36° 06′ E	4 viii	1809–2012	62 Co	SSE	22–27	SE	4	SSE	4	bc	1024·0	23·3
WS 1031	From 34° 14′ S, 29° 24′ E	3–4 ix	2045–	4093	NE	24	NE	4	NE	7	b	1014·0	19·4
	to 34° 20′ S, 29° 15′ E		0455	—	NE	11–16	NE	4	NE	6	c	1013·0	20·0
WS 1032	33° 59′ S, 28° 53′ E	4 ix	0845–0915	—	NNE	7–10	NNE	2	NE	6	b	1015·5	20·0
WS 1033	From 33° 49′ S, 28° 42′ E	4 ix	1126–	2893	NW	7–10	NW	2	NE	6	c	1013·3	20·0
	to 33° 52′ S, 28° 47′ E		1805	—	SW × W	7–10	NE	2	NE	6	bc	1013·0	20·0
WS 1034	33° 43′ S, 28° 40′ E	4 ix	2030–2041	—	SW	4–6	SW	2	NE	4	b	1013·2	19·4

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermo-meter	Wire angle	Temp. °C.	S ‰	σt	Mg.-atom $m.^3$		O_2 c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
20	100	—	—	20·6										
	130	—	—	17·9										
20	0	—	5°	24·24	35·12	23·68	0·04	—	4·88	**NH**	0	**1830**	**2000**	
	10	—	10°	24·28	35·13	23·67	0·04	—	—	**N 50 V**	50–0	**1845**	**1850**	Net split, catch [retained
	20	—	20°	24·27	35·12	23·67	0·13	—	4·87	**N 70 V**	50–0	**1904**	**1908**	
	30	—	25°	24·22	35·13	23·69	0·13							
	50	—	25°	24·02	35·12	23·74	0·13	—	4·91					
20	0	—	0°	19·80	35·44	25·17	0·20	—	5·30	**N 50 V**	100–0	**2132**	**2145**	[while hauling Lucas wire parted
	10	—	0°	19·81	35·46	25·18	0·17	—	—	**N 70 V**	1000–750	**2204**		GMT = zone − 2 hrs
20	20	—	5°	19·81	35·46	25·18	0·17	—	5·22	,,	750–500			
	30	—	5°	19·81	35·43	25·15	0·04	—	—	,,	500–250			
	50	—	5°	19·44	35·46	25·28	0·04	—	5·29	,,	250–100			
	75	—	5°	19·12	35·48	25·37	0·04	—	—	,,	100–50			
	100	—	10°	18·53	35·48	25·52	0·04	—	5·12	,,	50–0	—	—	Machine stopped:
	150	—	10°	18·18	35·47	25·61	0·09	—	—	,,	50–0	—	**0032**	catch discarded,
	200	—	10°	18·21	35·46	25·59	0·09	—	5·03					[repeated
	300	—	15°	17·48	35·52	25·81	0·20	—	4·93	**N 100 H**	5–0	**0351**	**0419**	
	400	—	20°	15·30	35·39	26·22	0·20	—	4·51	**N 100 B**	79–0	**0356**	**0415**	KT
	600	—	25°	12·98	35·18	26·56	0·20	—	4·40	**N 70 B**				
	790[2]	791	20°	10·92	34·87	26·71	0·63	—	4·59					
	990[2]	—		8·58	34·67	26·95	0·92	—	4·16					
	1480[2]	1482		4·11	34·49	27·39	1·76	—	3·44					
	1970[1]	1968	22°	3·11	34·65	27·61	2·10	—	3·18					
	2450[1]	—		2·60	34·70	27·71	1·00	—	3·90					
	2940[1]	2937		2·39	34·72	27·74	1·00	—	4·34					
21	0	—	—	19·4	—	—	—	—	—	**BT**	138–0	0842	0849	
	10	—	—	19·4	—	—	—	—	—	**N 50 V**	100–0	0845	—	Haul interrupted:
	20	—	—	19·4	—	—	—	—	—	,,	100–0	—	0911	catch discarded,
	30	—	—	19·4										[repeated
	50	—	—	19·0										
	75	—	—	18·9										
	100	—	—	18·8										
	138	—	—	18·1										
21	0	—	0°	20·93	35·36	24·81	0·04	—	5·11	**N 50 V**	100–0	1240	1247	Lucas wire parted
	10	—	0°	20·70	35·36	24·87	0·58	—	—	**N 70 V**	1000–750	1420		while sounding
21	20	—	0°	20·60	35·37	24·91	0·20	—	5·10	,,	750–500			
	30	—	0°	20·11	35·39	25·05	0·13	—	—	,,	500–250			
	50	—	0°	19·63	35·48	25·24	0·13	—	5·25	,,	250–100	—	—	Messenger fouled:
	75	—	0°	19·27	35·48	25·33	0·25	—	—	,,	250–100			catch discarded,
	100	—	5°	18·93	35·48	25·42	0·25	—	5·14	,,	100–50			[repeated
	150	—	5°	18·54	35·48	25·52	0·25	—	—	,,	50–0	—	1654	
	200	—	10°	17·93	35·43	25·63	0·38	—	4·78					
	300	—	10°	16·38	35·39	25·98	0·38	—	4·69					
	400	—	25°	14·81	35·35	26·30	0·58	—	4·66					
	600	—	20°	12·63	35·14	26·59	0·67	—	4·92					
	820[2]	819	10°	10·27	34·81	26·78	1·08	—	4·17					
	1020[2]	—		7·55	34·54	27·00	1·59	—	3·63					
	1520[2]	1518		3·97	34·54	27·45	2·10	—	2·95					
	2010[1]	2009	—	2·84	34·65	27·64	1·85	—	3·35					
	2540[1]	—	—	2·51	34·73	27·74	1·85	—	3·85					
	3060[1]	3061	—	2·27	34·74	27·77	1·59	—	4·10					
21	0	—	—	20·2	—	—	—	—	—	**BT**	138–0	**2031**	**2038**	
	10	—	—	20·2	—	—	—	—	—	**N 50 V**	100–0	**2036**	**2041**	
	20	—	—	20·0										
	30	—	—	19·9										
	50	—	—	19·9										
	75	—	—	19·9										
	100	—	—	19·4										
	138	—	—	18·7										

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp. (	
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb	W bul
WS 1035	33° 32′ S, 28° 26′ E	1950 5 ix	0603–0700	—	SW	17–21	WSW	3	WSW	4	c	1016·0	18·3	16·
WS 1036	33° 28′ S, 28° 19′ E	5 ix	0837–0903	—	W	22–27	W	4	W	4	c	1021·3	18·3	16
WS 1037	33° 04′ S, 27° 55′ E	5 ix	1900–2005	82*	SW × W	11–21	SW	3	SW	4	od	1024·0	15·0	13
WS 1038	33° 08′ S, 27° 59′ E	5 ix	2200–2256	83*	NW	11–16	NW	3	SW	4	c	1027·0	15·0	13
WS 1039	33° 12′ S, 28° 03′ E	5–6 ix	2340–0120	150*	W	11–16	NW	3	SW	4	c	1029·2	16·1	15
WS 1040	From 33° 15′ S, 28° 05′ E	6 ix	0330–	—	SSW	7–10	SSW	2	SW	4	od	1021·0	15·6	15
	to 33° 25′ S, 27° 57′ E		0640	—	Lt airs	2–5	WSW	1	WSW	2	o	1024·0	15·6	15
WS 1041	34° 33′ S, 24° 21′ E	7 ix	1200–1251	119*	W	4–6	SW	2	SW	1	b	1024·7	15·6	12
WS 1042	34° 41′ S, 22° 27′ E	8 ix	0001–0115	117*	W	7–10	W	2	SW	2	b	1020·0	14·4	13

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermo-meter	Wire angle	Temp. ° C.	S °/oo	σt	Mg.-atom m.³		O₂ c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
22	0	—	—	19·9	—	—	—	—	—	**BT**	134–0	**0615**	**0621**	
	10	—	—	20·0	—	—	—	—	—	**N 50 V**	100–0	0648	0658	
	20	—	—	20·0										
	30	—	—	20·0										
	50	—	—	19·9										
	75	—	—	19·1										
	100	—	—	18·9										
	134	—	—	18·4										
22	0	—	—	20·8	—	—	—	—	—	**N 50 V**	100–0	0838	0845	
	10	—	—	20·8	—	—	—	—	—	**BT**	135–0	0856	0903	
	20	—	—	20·8										
	30	—	—	20·7										
	50	—	—	19·4										
	75	—	—	19·0										
	100	—	—	18·5										
	135	—	—	17·6										
22	0	—	—	14·9	—	—	—	—	—	**N 50 V**	75–0	**1920**	**1925**	Net split: catch lost
	10	—	—	14·9	—	—	—	—	—	**BT**	75–0	**1922**	**1929**	
	20	—	—	14·9	—	—	—	—	—	**N 100 H**	5–0	**1947**	**2002**	
	30	—	—	14·8										
	50	—	—	14·7										
	75	—	—	14·6										
22	0	—	—	18·6	—	—	—	—	—	**BT**	77–0	**2203**	**2210**	
	9	—	—	18·6	—	—	—	—	—	**N 50 V**	75–0	**2211**	**2216**	
	10	—	—	17·7	—	—	—	—	—	**NH**	0	**2212**	**2217**	
	20	—	—	16·3	—	—	—	—	—	**N 100 H**	5–0	**2236**	**2256**	
	30	—	—	15·6										
	50	—	—	15·4										
	77	—	—	15·3										
22	0	—	—	20·3	—	—	—	—	—	**BT**	113–0	**2342**	**2350**	
	10	—	—	20·4	—	—	—	—	—	**N 50 V**	100–0	**2343**	—	No catch: net parted
	20	—	—	20·3	—	—	—	—	—	,,	100–0	—	**0034**	from bucket,
	30	—	—	19·7	—	—	—	—	—	**N 100 H**	5–0	**0053**	**0113**	[repeated
	50	—	—	18·7										
	75	—	—	17·2										
	100	—	—	16·3										
	113	—	—	15·9										
23	0	—	0°	20·72	35·32	24·83	0·04	—	5·15	**N 50 V**	100–0	**0344**	**0401**	
	10	—	0°	20·72	35·32	24·83	0·04	—	—	**N 70 V**	400–250	**0431**		
23	20	—	0°	20·72	35·34	24·85	0·04	—	5·25	,,	250–100			
	30	—	0°	20·60	35·34	24·88	0·04	—	—	,,	100–50			
	50	—	0°	20·13	35·35	25·02	0·04	—	5·29	,,	50–0	—	**0545**	
	75	—	5°	20·05	35·35	25·04	0·04	—	—	**N 100 H**	5–0	**0615**	0635	
	100	—	0°	17·12	35·37	25·79	0·50	—	4·24					
	150	—	10°	16·14	35·41	26·05	0·42							
	200	—	15°	13·83	35·26	26·44	0·42	—	4·53					
	300	—	10°	12·92	35·17	26·57	0·58	—	4·85					
	400	—	10°	10·47	34·89	26·81	0·67	—	4·85					
24	0	—	—	16·6	—	—	—	—	—	**BT**	111–0	1202	1209	
	10	—	—	16·5	—	—	—	—	—	**N 50 V**	100–0	1212	1217	
	20	—	—	16·4	—	—	—	—	—	**N 100 H**	5–0	1229	1249	
	30	—	—	13·5										
	50	—	—	10·7										
	75	—	—	9·9										
	100	—	—	9·2										
	111	—	—	9·1										
25	0	—	—	16·5	—	—	—	—	—	**BT**	113–0	**0003**	**0010**	
	10	—	—	16·5	—	—	—	—	—	**N 50 V**	100–0	**0003**	**0019**	Last 15 m. hauled
	20	—	—	16·4	—	—	—	—	—	**N 100 H**	5–0	**0045**	**0105**	[by hand

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp.
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1042 *cont.*	34° 41′ S, 22° 27′ E	1950 8 ix											
WS 1043	34° 21′ S, 18° 34′ E	19 ix	1305–1407	78*	S	1–3	S	1	SW	2	b	1024·5	14·4
WS 1044	34° 25′ S, 18° 30′ E	19 ix	1447–1543	88*	SSE	4–6	SSE	1	SW	2	b	1023·0	16·7
WS 1045	34° 20′ S, 18° 21′ E	19 ix	1705–1742	77*	S × W	4–6	SSE	1	SSW	2	b	1022·0	16·1
WS 1046	34° 03′ S, 18° 03′ E	19 ix	2040–2132	190*	S	4–6	S	1	SW	2	b	1022·0	15·0
WS 1047	32° 43′ S, 17° 38′ E	20 ix	0800–0853	227*	SSW	4–6	SSW	1	SSW	2	b	1022·4	15·0
WS 1048	31° 25′ S, 17° 13′ E	20 ix	2000–2055	216*	S	17–21	S × W	2	S	3	b	1022·0	15·0
WS 1049	29° 55′ S, 16° 41′ E	21 ix	0800–0820	161*	S × W	17–21	S × W	3	SSW	3	o	1018·3	13·3

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermometer	Wire angle	Temp. ° C.	S ‰	σt	Mg.-atom m.^{3}		O_2 c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
25	30	—	—	16·4										
	50	—	—	14·5										
	75	—	—	10·5										
	100	—	—	10·0										
	113	—	—	9·8										
7	0	—	—	15·0	—	—	—	—	—	**BT**	76–0	1308	1313	
	10	—	—	14·4	—	—	—	—	—	**N 50 V**	75–0	1318	1322	
	20	—	—	14·3	—	—	—	—	—	**N 100 H**	5–0	1343	1403	
	30	—	—	14·2										
	50	—	—	13·3										
	55	—	—	11·7										
	76	—	—	10·7										
7	0	—	—	15·6	—	—	—	—	—	**BT**	82–0	1457	1502	
	10	—	—	14·8	—	—	—	—	—	**N 50 V**	75–0	1458	1502	
	20	—	—	14·7	—	—	—	—	—	**N 100 H**	5–0	1515	1538	
	30	—	—	14·7										
	50	—	—	13·9										
	60	—	—	12·8										
	72	—	—	12·4										
	75	—	—	11·4										
	82	—	—	10·3										
7	0	—	—	15·6	—	—	—	—	—	**N 50 V**	70–0	1705	1709	
	10	—	—	14·9	—	—	—	—	—	**BT**	67–0	1707	1712	Poor trace: repeated
	20	—	—	14·4	—	—	—	—	—	,,	67–0	1713	1719	
	30	—	—	13·8	—	—	—	—	—	**N 100 H**	5–0	1720	1740	
	50	—	—	12·1										
	61	—	—	11·0										
	67	—	—	10·8										
7	0	—	—	14·0	—	—	—	—	—	**BT**	138–0	**2045**	**2052**	
	10	—	—	12·7	—	—	—	—	—	**N 50 V**	100–0	**2047**	**2053**	
	20	—	—	11·9	—	—	—	—	—	**N 100 H**	5–0	**2111**	**2131**	
	30	—	—	10·5										
	50	—	—	8·9										
	75	—	—	8·1										
	100	—	—	7·6										
	138	—	—	6·6										
8	0	—	—	13·8	—	—	—	—	—	**BT**	134–0	0806	0813	
	10	—	—	13·6	—	—	—	—	—	**N 50 V**	100–0	0807	0812	
	20	—	—	12·8	—	—	—	—	—	**N 100 H**	5–0	0830	0850	
	30	—	—	12·7										
	50	—	—	10·8										
	75	—	—	9·3										
	100	—	—	8·6										
	134	—	—	7·7										
8	0	—	—	14·9	—	—	—	—	—	**BT**	132–0	**2005**	**2011**	
	10	—	—	14·9	—	—	—	—	—	**N 50 V**	100–0	**2009**	**2016**	
	20	—	—	14·9	—	—	—	—	—	**N 100 H**	5–0	**2033**	**2053**	
	30	—	—	14·9										
	43	—	—	14·7										
	50	—	—	13·9										
	60	—	—	13·3										
	75	—	—	11·6										
	100	—	—	10·4										
	132	—	—	9·2										
9	0	—	—	12·2	—	—	—	—	—	**BT**	138–0	0811	0817	
	10	—	—	12·2										
	20	—	—	12·2										
	30	—	—	12·2										
	50	—	—	11·1										

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp.
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1049 *cont.*	29° 55′ S, 16° 41′ E	1950 21 ix											
WS 1050	28° 39′ S, 16° 15′ E	21 ix	1847–2011	73*	Lt airs	2–5	SW	1	SW	3	b	1016·0	12·8
WS 1051	28° 40′ S, 15° 56′ E	21–22 ix	2220–0045	128 d.gn.M	Lt airs	2–5	SW	1	SW	3	b	1019·5	12·8
WS 1052	28° 39′ S, 15° 29·5′ E	22 ix	0741–0955	172 gn.br. M.sk. bl	SSE	5–9	SW	1	SW	2	o	1018·0	13·9
WS 1053	28° 40′ S, 14° 59′ E	22 ix	1347–1619	177 gn.br.M	S	17–21	S	3	S	4	b	1018·0	15·0
WS 1054	28° 40′ S, 14° 42′ E	22 ix	1816–2035	199 y.br.M	S	17–21	S	3	S	4	o	1016·0	14·4
WS 1055	28° 39′ S, 14° 07′ E	23 ix	0910–1403	902 gn.gy. Gl.Oz	SSE	11–16	SSE	1	SSE	3	o	1018·0	13·9
WS 1056	28° 41′ S, 13° 25′ E	23–24 ix	1922–0210	2586 lt.y.gy. Gl.Oz	S	4–6	S×E	1	Sly	1	o	1016·0	15·0

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermometer	Wire angle	Temp. ° C.	S ‰	σt	Mg.-atom m.³		O_2 c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
9	75	—	—	9·3										
	100	—	—	8·9										
	138	—	—	8·2										
9	0	—	0°	11·69	33·91	25·82	2·10	—	4·25	**N 50 V**	60–0	**1857**	**1900**	
	10	—	0°	10·39	34·54	26·55	2·10	—	—	**N 70 V**	50–0	**1912**	**1915**	
	20	—	0°	10·09	34·64	26·68	2·17	—	2·70	**N 100 H**	5–0	**1949**	**2009**	
	30	—	0°	9·79	34·70	26·78	2·17							
	50	—	0°	9·39	34·67	26·82	2·88	—	2·12					
	70	—	5°	9·37	34·68	26·83	2·23	—	0·92					
9	0	—	0°	11·89	34·60	26·31	0·92	—	6·17	**N 50 V**	100–0	**2232**	**2237**	
	10	—	0°	11·81	34·60	26·33	0·92	—	—	**N 70 V**	100–50	**2300**		
	20	—	0°	11·81	34·65	26·37	0·92	—	5·55	,,	50–0	—	**2320**	
	30	—	0°	11·62	34·79	26·52	1·00	—	—	**N 100 H**	5–0	**0024**	**0044**	
	50	—	10°	11·03	34·76	26·60	1·85	—	4·02					
	75	—	10°	9·33	34·76	26·89	2·36							
	100	—	10°	9·31	34·76	26·90	2·61	—	1·11					
	125	—	15°	9·27	34·79	26·93	2·36	—	1·10					
10	0	—	0°	13·58	34·88	26·20	0·42	—	6·10	**N 50 V**	100–0	0759	0804	
	10	—	0°	13·58	34·88	26·20	0·42	—	—	**N 70 V**	150–100	0816		
	20	—	5°	13·57	34·88	26·20	0·50	—	6·17	,,	100–50			
	30	—	8°	13·43	34·90	26·25	0·42	—	—	,,	50–0	—	0848	
	50	—	10°	13·08	34·89	26·31	0·50	—	5·92	**N 100 B** **N 70 B** }	155–0	0926	0951	KT
	75	—	16°	11·42	34·88	26·62	1·08	—	—					
	100	—	18°	9·82	34·72	26·78	1·42	—	4·05	**N 100 H**	5–0	0931	0953	
	150	—	25°	8·71	34·54	26·83	2·10	—	2·75					
	170	—	30°	8·62	34·56	26·85	1·98	—	3·04					
10	0	—	5°	14·10	34·91	26·12	0·13	—	6·08	**N 50 V**	100–0	1410	1418	
	10	—	5°	14·13	34·91	26·11	0·13	—	—	**N 70 V**	150–100	1431		
	20	—	5°	13·84	34·91	26·17	0·25	—	6·02	,,	100–50			
	30	—	10°	13·70	34·93	26·21	0·25	—	—	,,	50–0	—	1509	
	50	—	10°	13·53	34·93	26·25	0·42	—	5·80	**N 100 B** **N 70 B** }	174–0	1555	1616	KT
	75	—	15°	13·34	34·94	26·30	0·42	—	—					
	100	—	15°	11·64	34·88	26·58	0·67	—	4·65	**N 100 H**	5–0	1605	1617	
	150	—	20°	8·93	34·63	26·86	1·85	—	2·91					
	175	—	25°	8·88	34·69	26·91	1·85	—	2·81					
10	0	—	5°	13·99	34·96	26·17	0·42	—	6·13	**N 50 V**	100–0	1841	**1850**	
	10	—	10°	13·98	34·97	26·19	0·20	—	—	**N 70 V**	175–100	**1858**	—	Did not fish pro- [perly: repeated
	20	—	15°	13·83	34·97	26·22	0·25	—	6·03	,,	175–100			
	30	—	15°	13·73	34·96	26·23	0·29	—	—	,,	100–50			
	50	—	20°	13·32	34·97	26·33	0·33	—	5·62	,,	50–0	—	**1948**	
	75	—	25°	10·77	34·90	26·76	1·08	—	—	**N 100 H**	5–0	**2013**	**2033**	
	100	—	25°	10·17	34·83	26·81	1·08	—	4·09					
	150	—	25°	9·24	34·70	26·87	1·68	—	3·14					
	190	—	25°	9·13	34·70	26·89	1·85	—	3·12					
11	0	—	0°	14·80	35·15	26·15	0·29	—	6·11	**N 50 V**	100–0	0957	1003	
	10	—	0°	14·80	35·15	26·15	0·29	—	—	**N 70 V**	750–500	1023		
	20	—	5°	14·79	35·15	26·15	0·42	—	5·90	,,	500–250			
	30	—	8°	14·78	35·16	26·16	0·25	—	—	,,	250–100			
	50	—	10°	14·62	35·16	26·19	0·33	—	5·84	,,	100–50	—	—	Did not fish: [repeated
	75	—	11°	13·94	35·10	26·30	0·50	—	—	,,	100–50			
	100	—	13°	13·42	35·04	26·36	0·83	—	5·03	,,	50–0	—	1204	
	150	—	15°	12·01	34·94	26·56	0·83	—	—	**N 100 B** **N 70 B** }	141–0	1331	1352	KT
	200	—	17°	10·92	34·88	26·71	1·08	—	4·57					
	300	—	23°	8·72	34·65	26·90	1·34	—	4·55	**N 100 H**	5–0	1340	1400	
	400	—	30°	6·94	34·49	27·04	1·98	—	4·05					
	540^1	543	—	5·34	34·40	27·18	1·98	—	3·60					
	720^1	723	—	4·67	34·38	27·25	2·23	—	2·98					
11	0	—	0°	15·16	35·17	26·09	<0·04	—	5·96	**N 50 V**	100–0	**2030**	**2042**	
	10	—	0°	15·16	35·30?	26·19?	<0·04	—	—	**N 70 V**	1000–750	**2050**	—	Net did not fish pro- [perly: repeated

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp. °
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1056 *cont.*	28° 41′ S, 13° 25′ E	1950 23–24 ix											
WS 1057	28° 02′ S, 13° 37′ E	24 ix	1715–1816	—	WSW	4–6	S	1	S	1	bc	1014·0	15·6
WS 1058	27° 33′ S, 13° 48′ E	24 ix	2205–2252	—	Lt airs	0–3	—	0	S	1	bc	1017·0	14·4
WS 1059	27° 14′ S, 14° 00′ E	25 ix	0135–0230	860*	Calm	0	—	0	S	1	o	1017·0	14·4
WS 1060	26° 50′ S, 14° 15′ E	25 ix	0545–0640	388*	Calm	0	—	0	—	0	oz	1016·0	14·4
WS 1061	26° 25′ S, 14° 32′ E	25 ix	1030–1115	309*	E	1–3	E	1	S	2	c	1018·0	14·4
WS 1062	25° 35′ S, 14° 27′ E	25 ix	1750–1844	166*	WSW	4–6	—	0	S	2	bc	1014·0	14·4

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermo-meter	Wire angle	Temp. °C.	S ‰	σt	Mg.-atom m.³ P inorganic	Mg.-atom m.³ P total	O₂ c.c. litre	Gear	Depth (metres)	TIME From	TIME To	
11	20	—	0°	15·13	35·17	26·10	<0·04	—	5·89	**N 70 V**	1000–750			
	30	—	0°	15·10	35·19	26·11	<0·04	—	—	,,	750–500			
	50	—	0°	15·04	35·19	26·13	0·17	—	5·80	,,	500–250			
	75	—	0°	14·41	35·14	26·23	0·20	—	—	,,	250–100			
	100	—	0°	13·84	35·05	26·27	0·20	—	5·36	,,	100–50			
	150	—	0°	12·33	35·04	26·58	0·83	—	—	,,	50–0	—	**0000**	
	200	—	0°	10·89	34·83	26·68	0·92	—	4·66	**NH**	0	**2350**	**0040**	
	300	—	5°	8·86	34·65	26·88	1·42	—	4·31	**N 100 B**	151–0	**0141**	**0200**	KT
	400	—	5°	6·68	34·51	27·10	1·85	—	3·65	**N 70 B**				
	600	—	5°	4·68	34·33	27·20	1·85	—	4·20	**N 100 H**	5–0	**0145**	**0205**	
	820^2	817	5°	3·79	34·47	27·41	2·23	—	3·48					
	1030^2	—		3·45	34·43	27·41	2·23	—	3·15					
	1240^2	1243		3·18	34·52	27·51	2·23	—	3·52					
	1540^1	1535	10°	3·12	34·67	27·63	1·91	—	4·11					
	2060^1	—		3·00	34·81	27·76	1·59	—	4·46					
	2580^1	2578		2·71	34·81	27·79	1·59	—	4·79					
12	0	—	—	15·5	—	—	—	—	—	**BT**	138–0	1720	1726	
	10	—	—	15·3	—	—	—	—	—	**N 50 V**	100–0	1723	1728	
	20	—	—	15·2	—	—	—	—	—	**NH**	0	1730	1805	
	30	—	—	15·2	—	—	—	—	—	**N 100 H**	5–0	1745	1805	
	50	—	—	15·2										
	75	—	—	14·9										
	100	—	—	14·9										
	138	—	—	13·8										
12	0	—	—	15·1	—	—	—	—	—	**BT**	131–0	**2210**	**2218**	
	10	—	—	15·0	—	—	—	—	—	**N 50 V**	100–0	**2212**	**2218**	
	20	—	—	15·0	—	—	—	—	—	**NH**	0	**2219**	**2230**	
	30	—	—	15·0	—	—	—	—	—	**N 100 H**	5–0	**2232**	**2252**	
	50	—	—	15·0										
	75	—	—	15·0										
	100	—	—	14·9										
	131	—	—	13·7										
13	0	—	—	14·9	—	—	—	—	—	**N 50 V**	100–0	**0135**	**0142**	
	10	—	—	15·0	—	—	—	—	—	**BT**	135–0	**0136**	**0143**	
	20	—	—	14·9	—	—	—	—	—	**N 100 H**	5–0	**0209**	**0229**	
	30	—	—	14·9										
	50	—	—	14·9										
	75	—	—	14·8										
	100	—	—	13·9										
	138	—	—	12·7										
13	0	—	—	13·4	—	—	—	—	—	**BT**	133–0	**0553**	**0559**	
	10	—	—	13·4	—	—	—	—	—	**N 50 V**	100–0	**0558**	**0603**	
	20	—	—	13·2	—	—	—	—	—	**N 100 H**	5–0	**0615**	**0635**	
	30	—	—	12·9										
	50	—	—	12·8										
	75	—	—	12·6										
	100	—	—	12·2										
	133	—	—	11·1										
13	0	—	—	13·6	—	—	—	—	—	**N 50 V**	100–0	1035	1041	
	10	—	—	13·4	—	—	—	—	—	**BT**	119–0	1036	1043	
	20	—	—	11·9	—	—	—	—	—	**N 100 H**	5–0	1051	1111	
	30	—	—	11·8										
	50	—	—	11·6										
	75	—	—	11·4										
	100	—	—	11·5										
	107	—	—	11·6										
	110	—	—	11·3										
	119	—	—	11·3										
13	0	—	—	13·3	—	—	—	—	—	**N 50 V**	100–0	1754	1800	
	10	—	—	12·2	—	—	—	—	—	**BT**	138–0	1755	1802	

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp.	
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb	
WS 1062 *cont.*	25° 35′ S, 14° 27′ E	1950 25 ix												
WS 1063	25° 11′ S, 14° 39′ E	25 ix	2150– 2353	69 R?	SW	4–6	SW	2	W	2	b	1018·0	12·2	10·
WS 1064	25° 12′ S, 14° 22′ E	26 ix	0900– 1240	139 d.gn.M. H_2S	SW	7–10	SW	2	WSW	2	b	1017·0	12·8	12
WS 1065	24° 56′ S, 14° 28′ E	26 ix	1440– 1453	106 d.gn.M. H_2S	S	11–16	S	2	SW	2	b	1016·0	14·4	11
WS 1066	24° 41′ S, 14° 30′ E	26 ix	1743– 1751	35 d.gn.S	SSW	7–10	SW	1	SSW	2	b	1015·5	13·4	12
WS 1067	24° 45′ S, 14° 27′ E	26 ix	1836– 1911	101 h	SSW	7–10	SW	1	SSW	2	b	1016·0	13·3	12
WS 1068	25° 12′ S, 14° 03′ E	26 ix	2330– 2359	198 bl.gn. M & Sh	SSW	7–10	SW	1	SW	2	b	1018·0	13·3	12
WS 1069	25° 11′ S, 13° 47′ E	27 ix	0739– 1127	236 gn.bl. S & Sh	S	11–16	S	1	S	2	b	1018·0	13·9	13
WS 1070	From 25° 15′ S, 13° 06′ E	27 ix	1750–	1785 gn.gy.	S	17–21	S	1	S	3	bc	1018·5	15·0	1
	to 25° 10′ S, 13° 06′ E		2318	Gl.Oz	S	7–10	S	2	S	3	b	1020·5	13·9	1

	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
Age of moon (days)	Depth (metres)	Depth by thermometer	Wire angle	Temp. ° C.	S °/₀₀	σt	Mg.-atom m.³		O_2 c.c. litre	Gear	Depth (metres)	TIME		
							P inorganic	P total				From	To	
13	20	—	—	12·2	—	—	—	—	—	**NH**	0	1755	1815	
	30	—	—	11·6	—	—	—	—	—	**N 100 H**	5–0	1820	1840	
	50	—	—	11·1										
	61	—	—	11·0										
	75	—	—	11·1										
	100	—	—	10·4										
	138	—	—	9·7										
13	0	—	0°	11·14	34·76	26·58	1·42	—	5·20	**N 50 V**	50–0	**2213**	**2216**	
	10	—	0°	10·49	34·76	26·70	1·68	—	—	**N 70 V**	50–0	**2227**	**2231**	
	20	—	0°	10·42	34·76	26·71	1·68	—	4·24	**N 100 H**	5–0	**2330**	**2350**	
	30	—	5°	10·24	34·76	26·74	1·98							
	50	—	8°	9·73	34·74	26·82	2·23	—	1·28					
	65	—	8°	9·68	34·74	26·83	2·23	—	0·79					
14	0	—	0°	11·69	34·78	26·50	1·08	—	5·72	**NH**	0	0930	1130	
	10	—	0°	11·43	34·78	26·54	1·08	—	—	**N 50 V**	100–0	1016	1021	
	20	—	0°	10·97	34·79	26·64	1·25	—	5·38	**N 70 V**	100–50	1031		
	30	—	0°	10·77	34·76	26·65	1·42	—	—	,,	50–0	—	1058	
	50	—	0°	10·60	34·78	26·70	1·68	—	4·63	**N 100 B**	101–0	1211	1230	KT
	75	—	0°	10·46	34·79	26·73	1·68	—	—	**N 70 B**				
	100	—	0°	9·96	34·79	26·72	1·98	—	1·91	**N 100 H**	5–0	1219	1239	
	135	—	5°	9·63	34·79	26·87	1·85	—	0·43					
	137	—	—	9·62	—	—	1·85	—	—	—	—	—	—	No H_2S present
14	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
14	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
14	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
14	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
15	0	—	0°	13·46	34·92	26·25	0·67	—	6·05	**NH**	0	—	—	While ship lying to [prior to Station
	10	—	0°	13·30	34·94	26·30	0·67	—	—	**N 50 V**	100–0	0917	0924	
	20	—	7°	13·01	34·94	26·36	0·58	—	5·88	**N 70 V**	250–100	0934	—	Drifted to deeper [water, > 250 m.
	30	—	10°	12·72	34·92	26·40	0·58	—	—	,,	100–50			
	50	—	15°	12·73	34·92	26·40	0·83	—	5·59	,,	50–0	—	1004	
	75	—	15°	12·20	34·92	26·50	1·00	—	—	**N 100 B**	201–0	1052	1123	KT
	100	—	20°	11·71	34·89	26·58	1·17	—	3·92	**N 70 B**				
	150	—	25°	10·58	34·83	26·74	1·85	—	—	**N 100 H**	5–0	1103	1124	
	200	—	35°	10·27	34·81	26·78	1·85	—	2·07					
15	0	—	0°	13·80	34·94	26·20	0·67	—	6·00	**NH**	0	1820	1828	
	10	—	0°	13·83	34·96	26·20	0·58	—	—	**N 50 V**	100–0	1829	1835	
15	20	—	5°	13·80	34·96	26·21	0·50	—	6·04	**N 70 V**	1000–750	1847	—	Haul repeated
	30	—	10°	13·80	34·96	26·21	0·58	—	—	,,	1000–750			
	50	—	10°	13·27	34·96	26·32	0·58	—	5·28	,,	750–500			
	75	—	10°	12·70	34·97	26·45	0·67	—	—	,,	500–250			
	100	—	15°	12·20	34·97	26·55	0·58	—	4·69	,,	250–100			
	150	—	20°	11·39	34·92	26·66	0·92	—	—	,,	100–50			
	200	—	20°	10·52	34·87	26·78	1·68	—	2·78	,,	50–0	—	**2117**	
	300	—	25°	9·02	34·69	26·89	1·85	—	2·17	**N 100 B**	183–0	**2247**	**2315**	KT
	400	—	30°	7·70	34·63	27·05	2·23	—	1·89	**N 70 B**				
	600^{2}	602	15°	5·44	34·42	27·18	2·23	—	2·36	**N 100 H**	5–0	**2253**	**2316**	
	820^{2}	824		4·40	34·42	27·29	2·23	—	3·16					
	990^{1}	991	25°	3·76	34·43	27·38	2·10	—	3·34					
	1200^{1}	—		3·43	34·52	27·48	1·98	—	3·57					
	1510^{1}	1511		3·25	34·67	27·62	1·85	—	4·20					

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Tem
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1071	24° 50′ S, 13° 19′ E	1950 28 ix	0250– 0355	—	S×E	17–21	S×E	3	S	3	b	1018·0	14·0
WS 1072	24° 20′ S, 13° 38′ E	28 ix	0810– 0910	327*	SSW	11–16	SSW	3	SW	3	b	1017·0	13·9
WS 1073	23° 50′ S, 13° 57′ E	28 ix	1333– 1418	201*	S	7–10	S	2	S	1	b	1017·0	14·4
WS 1074	23° 22′ S, 14° 11′ E	28 ix	1905– 2020	115 d.gn.M. H_2S	S	7–10	S	1	S	2	b	1015·7	13·3
WS 1075	22° 44′ S, 14° 21′ E	29 ix	0644– 0903	66 gn.gy.bl. M. H_2S	SSE	7–10	S	1	S	1	bc	1016·8	10·6
WS 1076	22° 52′ S, 14° 20′ E	29 ix	1033– 1237	69 d.gn.M. H_2S	Lt airs	0–2	—	0	S	1	b	1018·4	13·9
WS 1077	22° 44′ S, 14° 08′ E	29 ix	1428– 1636	108 d.gn.M. H_2S	SW	7–10	SW	2	SW	1	b	1017·0	13·9
WS 1078	22° 46′ S, 13° 35′ E	29 ix	2025– 2315	139 d.br. M & Sh	S	11–16	S	3	S	1	b	1017·4	13·9

Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
	Depth (metres)	Depth by thermometer	Wire angle	Temp. ° C.	S ‰	σt	Mg.-atom m.³ P inorganic	Mg.-atom m.³ P total	O_2 c.c. litre	Gear	Depth (metres)	TIME From	TIME To	
16	0	—	—	14·5	—	—	—	—	—	**BT**	138–0	**0253**	**0300**	
	10	—	—	14·5	—	—	—	—	—	**N 50 V**	100–0	**0300**	**0307**	
	20	—	—	14·2	—	—	—	—	—	**N 100 H**	5–0	**0331**	**0351**	
	30	—	—	13·6										
	50	—	—	13·3										
	75	—	—	12·8										
	100	—	—	12·5										
	138	—	—	11·6										
16	0	—	—	13·7	—	—	—	—	—	**BT**	138–0	0821	0826	
	10	—	—	13·7	—	—	—	—	—	**N 50 V**	100–0	0823	0829	
	20	—	—	13·7	—	—	—	—	—	**N 100 H**	5–0	0850	0909	
	30	—	—	13·7										
	50	—	—	13·2										
	75	—	—	12·9										
	100	—	—	12·1										
	138	—	—	11·3										
16	0	—	—	13·1	—	—	—	—	—	**BT**	138–0	1333	1340	
	10	—	—	12·7	—	—	—	—	—	**N 50 V**	100–0	1338	1344	
	20	—	—	12·7	—	—	—	—	—	**N 100 H**	5–0	1355	1415	
	30	—	—	12·7										
	37	—	—	11·9										
	50	—	—	11·7										
	75	—	—	11·5										
	100	—	—	11·1										
	138	—	—	10·2										
16	0	—	—	12·1	—	—	—	—	—	**BT**	113–0	**1930**	**1937**	
	10	—	—	12·1	—	—	—	—	—	**N 50 V**	100–0	**1930**	**1939**	
	20	—	—	11·9	—	—	—	—	—	**N 100 H**	5–0	**1958**	**2018**	
	30	—	—	11·8										
	50	—	—	11·3										
	75	—	—	10·8										
	100	—	—	10·7										
	113	—	—	10·7										
17	0	—	0°	11·42	34·84	26·59	2·23	—	2·73	**N 50 V**	55–0	0705	0709	
	10	—	0°	11·41	34·86	26·61	2·10	—	—	**N 70 V**	50–0	0717	0721	
	20	—	0°	11·43	34·86	26·60	2·23	—	2·64	**N 100 H**	5–0	0842	0902	
	30	—	0°	11·42	34·87	26·61	2·23							
	50	—	0°	11·08	34·88	26·69	2·36	—	0·51					[60 m.
	60	—	0°	10·91	34·88	26·72	2·98	—	0·09	—	—	—	—	No H_2S present at
	64	—	0°	10·90	—	—	2·75	—	0·03	—	—	—	—	H_2S present at 64 m.
17	0	—	0°	11·93	34·86	26·51	2·10	—	3·51	**N 50 V**	50–0	1047	1052	
	10	—	0°	11·53	34·86	26·58	2·10	—	3·19	**NH**	0	1100	1130	
	20	—	0°	11·49	34·86	26·59	2·16	—	2·91	**N 70 V**	50–0	1107	1110	
	30	—	0°	11·46	34·87	26·61	2·16	—	2·86	**N 100 H**	5–0	1215	1235	
	40	—	0°	11·09	34·86	26·67	2·23	—	1·81					
	50	—	0°	11·01	34·87	26·69	2·23	—	1·68					[60 m.
	60	—	0°	11·05	34·88	26·69	2·61	—	0·21	—	—	—	—	No H_2S present at
	64	—	0°	10·99	34·87	26·69	2·61	—	0·06	—	—	—	—	H_2S present at 64 m.
17	0	—	0°	13·08	34·86	26·28	1·00	—	5·60	**N 50 V**	100–0	1441	1448	
	10	—	0°	12·33	34·87	26·44	1·00	—	—	**N 70 V**	100–50	1458		
	20	—	0°	12·28	34·87	26·45	1·34	—	5·05	,,	50–0	—	1513	
	30	—	5°	12·24	34·87	26·46	0·92	—	—	**N 100 B**	113–0	1610	1629	KT
	50	—	5°	11·47	34·87	26·61	1·59	—	2·41	**N 70 B**				
	75	—	10°	10·99	34·88	26·70	2·10	—	—	**N 100 H**	5–0	1615	1635	
	100	—	10°	11·00	34·97	26·78	2·75	—	0·10					
	107	—	10°	10·95	34·97	26·79	2·75	—	0·03	—	—	—	—	No H_2S present
17	0	—	5°	13·39	34·96	26·30	0·50	—	6·15	**N 50 V**	100–0	**2107**	**2116**	
	10	—	5°	13·40	34·96	26·29	0·50	—	—	**N 70 V**	100–50	**2128**		
	20	—	10°	13·33	34·96	26·31	1·00	—	6·05	,,	50–0	—	**2145**	

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Tem
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1078 *cont.*	22° 46′ S, 13° 35′ E	1950 29 ix											
WS 1079	22° 26′ S, 12° 43′ E	30 ix	0730– 1150	631 gy.gn.M. sk.bl	SE	22–27	S	3	SE	6	bc	1018·2	13·9
WS 1080	From 22° 51′ S, 11° 41′ E	2 x	1515–	3155 lt.gy.Gl. Oz	SSE	17–21	SSE	3	SSE	6	b	1019·0	15·6
	to 22° 43′ S, 11° 37′ E		2248		SSE	17–21	S	2	SSE	6	bc	1016·5	15·6
WS 1081	22° 45′ S, 12° 25′ E	3 x	1130–	1970 gy.Gl. Oz	S	4–6	S	2	SSW	1	b	1017·5	16·7
			1812		S	4–6	S	1–2	SSW	2	b	1014·3	16·1
WS 1082	22° 06′ S, 13° 56′ E	6 x	2025– 2050	69 d.gn.M. H_2S	NNW	17–21	NNW	3	—	0	fe	1017·0	13·9
WS 1083	21° 50′ S, 13° 45′ E	6–7 x	2348– 0020	69 d.gn.M. H_2S	NNW	11–16	NNW	3	NNW	1	o	1018·2	13·9
WS 1084	21° 33′ S, 13° 35′ E	7 x	0319– 0327	91 d.gn.M. H_2S	NW × N	7–10	NW	2	NNW	1	om	1018·0	14·4

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermo-meter	Wire angle	Temp. ° C.	S ‰	σt	Mg.-atom m.^{3}		O_2 c.c. litre	Gear	Depth (metres)	TIME		
								P inorganic	P total				From	To	
8	17	30	—	15°	13·03	34·93	26·35	0·92	—	—	**N 100 B**	155–0	**2238**	**2301**	Nets on bottom: no catch. KT
		50	—	20°	12·77	34·91	26·39	0·58	—	5·37	**N 70 B**				
		75	—	20°	12·23	34·88	26·47	1·34	—	—	**N 100 H**	5–0	**2245**	**2305**	
		100	—	35°	12·07	34·96	26·56	1·68	—	4·47					
		135	—	35°	11·24	34·97	26·73	1·85	—	1·14					
79	18	0	—	10°	15·09	35·17	26·11	0·83	—	5·72	**N 50 V**	100–0	0849	0858	
		10	—	15°	15·09	35·16	26·09	0·92	—	—	**N 70 V**	500–250	0911		
		20	—	15°	15·08	35·17	26·11	1·59	—	5·76	,,	250–100			
		30	—	15°	15·03	35·17	26·12	0·92	—	—	,,	100–50			
		50	—	20°	15·01	35·17	26·13	1·08	—	5·72	,,	50–0	—	1011	
		75	—	28°	13·63	35·12	26·37	1·17	—	—	**N 100 H**	5–0	1128	1148	
		100	—	40°	12·92	35·07	26·48	1·17	—	4·18					
		150	—	35°	12·25	35·04	26·59	1·68	—	—					
		200	—	35°	11·41	34·94	26·67	1·98	—	2·73					
		300	—	35°	9·88	34·81	26·85	2·23	—	1·37					
		400	—	40°	8·47	34·71	27·00	2·61	—	0·68					
		600	—	50°	7·19	34·58	27·08	2·36	—	1·23					
30	20	0	—	0°	15·24	35·13	26·04	0·58	—	5·75	**N 50 V**	100–0	1607	1614	
		10	—	5°	15·24	35·14	26·05	0·42	—	—	**N 70 V**	1000–750	1627		
	20	20	—	10°	15·24	35·12	26·03	0·20	—	5·74	,,	750–500			
		30	—	10°	15·08	35·12	26·06	0·20	—	—	,,	500–250			
		50	—	10°	15·05	35·12	26·07	0·33	—	5·73	,,	250–100			
		75	—	15°	15·02	35·13	26·08	0·42	—	—	,,	100–50			
		100	—	25°	13·14	35·04	26·41	0·42	—	4·52	,,	50–0	—	1810	
		150	—	30°	12·07	34·97	26·58	0·58	—	—	**N 100 B**	170–0	**2214**	**2243**	KT
		200	—	40°	11·25	34·89	26·66	0·58	—	2·70	**N 70 B**				
		300	—	40°	9·50	34·70	26·83	1·17	—	2·43	**N 100 H**	5–0	**2224**	**2245**	
		400	—	45°	8·11	34·60	26·96	1·51	—	1·72					
		600	—	50°	6·00	34·43	27·13	1·76	—	2·20					
		780^2	781	25°	4·56	34·38	27·26	2·23	—	2·80					
		990^2	—		3·84	34·42	27·35	1·68	—	3·26					
		1500^2	1502		3·33	34·70	27·64	1·68	—	4·25					
		1910^1	1905	40°	3·25	34·79	27·72	1·08	—	4·52					
		2420^1	—		2·93	34·80	27·76	0·92	—	4·61					
		2940^1	2944		2·61	34·81	27·80	1·25	—	4·94					
31	21	0	—	0°	15·61	35·16	25·97	0·67	—	5·85	**N 50 V**	100–0	1211	1217	
		10	—	0°	15·10	35·14	26·08	0·67	—	—	**N 70 V**	1000–750	1307		
	21	20	—	0°	15·05	35·15	26·10	0·50	—	5·80	,,	750–500			
		30	—	0°	15·03	35·17	26·12	0·75	—	—	,,	500–250			
		50	—	5°	14·91	35·15	26·13	1·00	—	5·81	,,	250–100			
		75	—	5°	14·89	35·15	26·13	1·00	—	—	,,	100–50			
		100	—	5°	13·36	35·15	26·46	1·00	—	3·23	,,	50–0	—	1446	
		150	—	10°	12·10	35·00	26·59	1·59	—	—	**N 100 B**	168–0	1745	1807	KT
		200	—	10°	11·25	34·93	26·69	1·85	—	2·29	**N 70 B**				
		300	—	15°	9·41	34·75	26·88	2·61	—	1·44	**N 100 H**	5–0	1750	1810	
		400	—	15°	7·96	34·63	27·01	2·75	—	1·19					
		600	—	20°	6·03	34·46	27·14	2·49	—	2·12					
		780^2	781	25°	4·64	34·43	27·29	2·36	—	2·78					
		990^2	986	25°	3·91	34·29	27·25	2·23	—	3·51					
		1100^1	1104	35°	3·62	34·51	27·46	1·98	—	3·61					
		1410^1	—		3·37	34·67	27·61	1·51	—	3·67					
		1670^1	1667		3·34	34·54	27·51	1·51	—	4·45					
82	24	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
83	24–25	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
84	25	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Tem
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1085	21° 16′ S, 13° 22′ E	1950 7 x	0638–0647	104 d.gn.M. H_2S	NW × N	4–10	NW	2	NNW	2	om	1017·0	13·9
WS 1086	20° 58′ S, 13° 10′ E	7 x	0920–0938	119 d.gn.M. St	NNW	1–3	—	0	NNW	1	om	1018·0	13·9
WS 1087	20° 54′ S, 13° 20′ E	7 x	1108–1120	69 d.gn.M. H_2S	Lt airs	0–3	—	0	NNW	1	om	1017·3	14·4
WS 1088	22° 02′ S, 11° 49′ E	8 x	0045–0142	—	SE	11–16	SW	2	SW	1	o	1014·5	15·0
WS 1089	21° 39′ S, 11° 55′ E	8 x	0445–0545	—	SE	4–6	SW	1	SW	2	om	1012·0	15·0
WS 1090	21° 11′ S, 12° 03′ E	8 x	0942–1025	—	SSE	7–10	SSE	1	SSE	1	om	1013·0	13·9
WS 1091	20° 38′ S, 12° 18′ E	8 x	1452–1553	313 y.gn. Fr.M	SW	4–6	SW	1	S	1	o	1012·0	15·0
WS 1092	20° 37′ S, 13° 14′ E	8 x	2200–2215	77 d.gn.- Di.M. H_2S	WNW	7–10	WNW	2	NW	1	o	1014·3	13·9
WS 1093	20° 10′ S, 12° 29′ E	9 x	0433–0600	205*	WNW	11–16	NW	2	NW	2	oe	1013·0	13·9
WS 1094	20° 17′ S, 13° 07′ E	9 x	0938–0952	77 d.gn.M	Lt airs	0–3	—	0	NW	2	o	1015·0	13·9

	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
								Mg.-atom m.³					TIME		
		Depth (metres)	Depth by thermo-meter	Wire angle	Temp. °C.	S ‰	σt	P inorganic	P total	O₂ c.c. litre	Gear	Depth (metres)	From	To	
5	25	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
86	25	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
87	25	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
88	26	0	—	—	16·1	—	—	—	—	—	BT	135–0	0046	0053	
		10	—	—	16·1	—	—	—	—	—	N 50 V	100–0	0052	0057	
		20	—	—	15·9	—	—	—	—	—	N 100 H	5–0	0117	0137	
		30	—	—	14·9										
		50	—	—	14·6										
		75	—	—	13·8										
		100	—	—	13·0										
		135	—	—	12·2										
89	26	0	—	—	15·6	—	—	—	—	—	BT	138–0	0455	0501	
		10	—	—	15·6	—	—	—	—	—	N 50 V	100–0	0456	0505	
		20	—	—	14·1	—	—	—	—	—	N 100 H	5–0	0519	0539	
		30	—	—	13·9										
		50	—	—	13·9										
		75	—	—	13·6										
		100	—	—	13·3										
		138	—	—	12·6										
90	26	0	—	—	15·3	—	—	—	—	—	BT	138–0	0941	0946	
		10	—	—	14·6	—	—	—	—	—	N 50 V	100–0	0943	0948	
		20	—	—	14·3	—	—	—	—	—	N 100 H	5–0	0958	1018	
		30	—	—	14·2										
		50	—	—	13·6										
		75	—	—	13·3										
		100	—	—	12·7										
		138	—	—	11·8										
91	26	0	—	—	15·6	—	—	—	—	—	BT	138–0	1515	1522	
		10	—	—	15·5	—	—	—	—	—	N 50 V	100–0	1518	1524	
		20	—	—	14·9	—	—	—	—	—	N 100 H	5–0	1531	1551	
		30	—	—	14·4										
		50	—	—	14·4										
		75	—	—	13·2										
		100	—	—	12·5										
		138	—	—	11·7										
092	26	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
093	27	0	—	—	14·2	—	—	—	—	—	N 50 V	100–0	0442	0448	
		10	—	—	14·2	—	—	—	—	—	BT	138–0	0512	0518	
		20	—	—	13·9	—	—	—	—	—	N 100 H	5–0	0529	0549	
		30	—	—	13·2										
		50	—	—	12·8										
		75	—	—	12·7										
		100	—	—	12·6										
		138	—	—	11·8										
094	27	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample

Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1095	19° 44′ S, 12° 47′ E	1950 9 x	1547–1552	79 d.gn. Di.M. H_2S	WNW	1–3	WNW	1	SW	2	o	1011·0	15·0
WS 1096	19° 43′ S, 12° 40′ E	9 x	1653–1939	110 d.gn.M. H_2S	WNW	4–6	WNW	1	SW	2	o	1010·5	15·0
WS 1097	19° 44′ S, 12° 21′ E	9–10 x	2300–0022	165 d.br.M. Sh	NNW	1–3	—	0	SW	2	om	1014·3	15·0
WS 1098	19° 44′ S, 12° 01′ E	10 x	0920–1408	304 gy.gn. Fr.M	Lt airs	—	—	0	SSW	2	om	1014·0	15·0
WS 1099	19° 44′ S, 11° 42′ E	10 x	1606–1720	380 gy.gn. Fr.M	W	4–6	W	1	S	2	o	1012·5	16·7
WS 1100	19° 44′ S, 11° 23′ E	10–11 x	2100–0040	677 y.gn. Gl.Oz	Lt airs	—	—	0	S	2	o	1014·2	15·6
WS 1101	19° 45′ S, 11° 05′ E	11 x	1345–1455	1105 y.gn. Fr.Oz	SSW	1–3	SSW	1	SW	1	o	1014·0	17·2

on	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermo-meter	Wire angle	Temp. ° C.	S ‰	σt	Mg.-atom $m.^3$		O_2 c.c. litre	Gear	Depth (metres)	TIME		
								P inorganic	P total				From	To	
095	27	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
.096	27	0	—	0°	14·71	35·02	26·08	0·13	—	8·21	**NH**	0	1700	1720	
		10	—	0°	13·49	35·01	26·32	0·67	—	—	**LH**	*ca.* 25	1700	1908	
		20	—	0°	12·90	35·01	26·44	1·42	—	4·56	**N 50 V**	100–0	1704	1711	
		30	—	0°	12·48	35·01	26·53	1·76	—	—	**N 70 V**	100–50	1725		
		50	—	0°	12·17	35·03	26·60	1·85	—	2·17	,,	50–0	—	1740	
		75	—	0°	11·77	35·01	26·66	2·49	—	—	**N 100 H**	5–0	**1909**	**1929**	
		100	—	0°	11·73	35·01	26·67	2·55	—	0·26					
1097	27	0	—	—	14·3	—	—	—	—	—	**N 50 V**	100–0	**2324**	**2329**	
		10	—	—	14·2	—	—	—	—	—	**BT**	138–0	**2333**	**2340**	
		20	—	—	14·2	—	—	—	—	—	**N 100 H**	5–0	**0000**	**0020**	
		30	—	—	14·1	—	—	—	—	—	**LH**	*ca.* 25			During and following Station
		50	—	—	13·4										
		75	—	—	13·2										
		100	—	—	12·4										
		138	—	—	11·8										
1098	28	0	—	0°	15·11	35·16	26·08	0·92	—	6·27	**N 50 V**	100–0	1124	1130	
		10	—	0°	14·70	35·16	26·17	1·00	—	—	**N 70 V**	250–100	1140		
		20	—	0°	14·43	35·16	26·23	1·00	—	5·64	,,	100–50			
		30	—	0°	14·34	35·17	26·27	1·00	—	—	,,	50–0	—	1210	
		50	—	0°	14·15	35·16	26·29	1·08	—	5·31	**N 100 B** **N 70 B**	181–0	1338	1403	KT
		75	—	2°	13·84	35·16	26·36	1·34	—	—					
		100	—	3°	12·72	35·10	26·55	1·76	—	3·13	**N 100 H**	5–0	1346	1406	
		150	—	3°	12·43	35·10	26·60	1·85							
		200	—	5°	12·08	35·11	26·68	1·85	—	1·66					
		300	—	5°	10·94	34·99	26·80	2·23	—	0·35					
1099	28	0	—	—	16·2	—	—	—	—	—	**N 50 V**	100–0	1621	1627	
		10	—	—	15·9	—	—	—	—	—	**BT**	138–0	1625	1631	
		20	—	—	15·1	—	—	—	—	—	**N 100 H**	5–0	1655	1715	
		30	—	—	14·4										
		50	—	—	13·3										
		75	—	—	13·3										
		100	—	—	12·9										
		138	—	—	12·7										
1100	28	0	—	0°	15·92	35·21	25·95	0·67	—	6·76	**NH**	0	**2135**	**0010**	
		10	—	0°	15·35	35·21	26·08	0·92	—	—	**N 50 V**	100–0	**2158**	**2203**	
		20	—	0°	15·04	35·21	26·15	1·00	—	6·17	**N 70 V**	500–250	**2220**		
		30	—	0°	14·94	35·21	26·17	1·17	—	—	,,	250–100			
		50	—	0°	14·42	35·20	26·27	1·00	—	5·45	,,	100–50			
		75	—	0°	14·26	35·21	26·32	1·17	—	—	,,	50–0	—	**2311**	
		100	—	0°	13·61	35·17	26·42	1·68	—	4·73	**N 100 B** **N 70 B**	157–0	**0009**	**0032**	KT
		150	—	0°	12·97	35·12	26·51	1·68	—	—					
		200	—	0°	12·31	35·14	26·66	1·68	—	0·55	**N 100 H**	5–0	**0012**	**0033**	
		300	—	0°	10·25	34·87	26·83	1·85	—	1·28					
		400	—	10°	8·74	34·69	26·93	2·23	—	0·79					
		600	—	5°	5·95	34·51	27·19	2·61	—	1·88					
1101	29	0	—	—	16·7	—	—	—	—	—	**BT**	138–0	1401	1406	Imperfect trace: repeated
		10	—	—	16·2	—	—	—	—	—	**N 50 V**	100–0	1405	1410	
		15	—	—	14·9	—	—	—	—	—	**BT**	138–0	1409	1414	
		20	—	—	14·9	—	—	—	—	—	**N 100 H**	5–0	1432	1452	
		30	—	—	14·8										
		50	—	—	14·4										
		75	—	—	13·6										
		100	—	—	13·3										
		138	—	—	13·2										

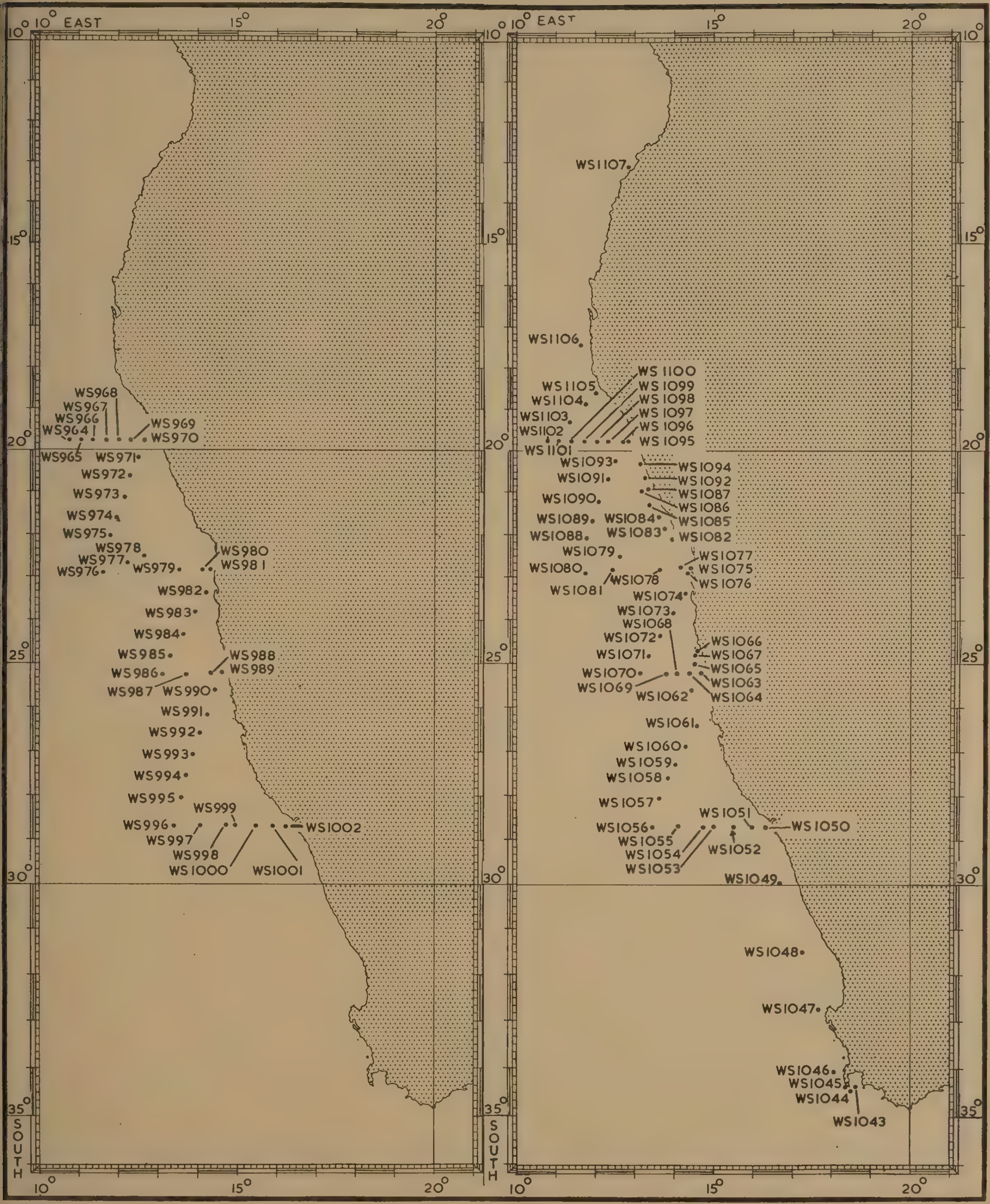
Station	Position	Date	Hour	Sounding (metres)	WIND		SEA		SWELL		Weather	Barometer (millibars)	Air Temp
					Direction	Force (knots)	Direction	Force	Direction	Force			Dry bulb
WS 1102	19° 44′ S, 10° 46′ E	1950 11 x	1707–	1181 y.gn.	Lt airs	2–5	SSW	1	SW	1	0	1012·4	17·2
			2155	Gl.Oz	Lt airs	2–5	SSW	1	SW	1	0	1015·0	16·7
WS 1103	19° 16′ S, 11° 18′ E	12 x	0238– 0343	673*	SSE	4–6	SSE	1	S	1	0	1015·0	16·7
WS 1104	18° 52′ S, 11° 44′ E	12 x	0813– 0917	271*	SE	7–10	SE	3	—	0	0	1013·6	16·1
WS 1105	18° 34′ S, 12° 00′ E	12 x	1229– 1343	79 d.gn.M. H_2S	SE	4–6	S	2	SSE	1	0	1013·4	16·1
WS 1106	17° 26′ S, 11° 38′ E	13 x	0215– 0233	80 d.gn.M. H_2S	S	7–10	S	1	S	1	0	1014·0	15·6
WS 1107	13° 05′ S, 12° 50′ E	14 x	1520– 1523	77 br.gn. S & Sh	Calm	0	—	0	—	0	b	1012·0	21·7

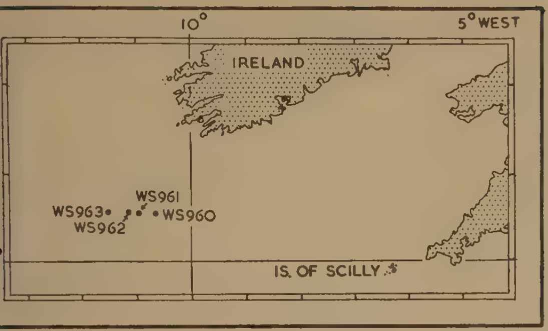
on	Age of moon (days)	HYDROLOGICAL OBSERVATIONS									BIOLOGICAL OBSERVATIONS				Remarks
		Depth (metres)	Depth by thermometer	Wire angle	Temp. °C.	S ‰	σt	Mg.-atom m.³ P inorganic	Mg.-atom m.³ P total	O_2 c.c. litre	Gear	Depth (metres)	TIME From	TIME To	
1102	29	0	—	0°	16·45	35·21	25·83	0·67	—	6·89	**N 50 V**	100–0	1722	1730	
		10	—	0°	15·87	35·19	25·94	0·67	—	—	**N 70 V**	1000–750	1742		
	29	20	—	0°	15·30	35·21	26·09	0·83	—	6·37	,,	750–500	—	—	Closed prematurely: no catch, repeated
		30	—	0°	14·70	35·19	26·20	0·33	—	—	,,	750–500			
		50	—	0°	14·59	35·21	26·24	0·92	—	5·28	,,	500–250	—	—	Closed prematurely: repeated
		75	—	0°	14·12	35·16	26·30	1·00	—	—	,,	500–250			
		100	—	0°	13·73	35·16	26·38	1·59	—	4·67	,,	250–100			
		150	—	2°	13·20	35·16	26·49	1·68	—	—	,,	100–50			
		200	—	3°	12·10	35·05	26·62	1·85	—	0·99	,,	50–0	—	**2045**	
		300	—	5°	9·83	34·78	26·83	1·85	—	0·77	**NH**	0	1900	**2030**	
		400	—	5°	8·64	34·69	26·95	2·10	—	0·79	**N 100 B**	166–0	**2123**	**2145**	KT
		630[1]	627	5°	6·03	34·31	27·02	2·23	—	1·93	**N 70 B**				
		820[1]	—		4·51	34·40	27·27	2·36	—	2·77	**N 100 H**	5–0	**2126**	**2146**	
		960[1]	964		4·00	34·41	27·34	2·06	—	3·39					
1103	0	0	—	—	15·8	—	—	—	—	—	**BT**	138–0	**0235**	**0242**	Poor trace: repeated
		10	—	—	15·5	—	—	—	—	—	**N 50 V**	100–0	**0244**	**0249**	
		20	—	—	14·4	—	—	—	—	—	**BT**	138–0	**0245**	**0252**	
		30	—	—	14·3	—	—	—	—	—	**NH**	0	**0250**	**0310**	
		50	—	—	14·1	—	—	—	—	—	**N 100 H**	5–0	**0319**	**0339**	
		75	—	—	13·7										
		100	—	—	13·4										
		138	—	—	13·2										
1104	0	0	—	—	15·1	—	—	—	—	—	**BT**	135–0	0820	0826	
		10	—	—	14·8	—	—	—	—	—	**N 50 V**	100–0	0822	0828	
		20	—	—	14·2	—	—	—	—	—	**N 100 H**	5–0	0852	0912	
		30	—	—	14·1										
		50	—	—	13·7										
		75	—	—	13·3										
		100	—	—	12·8										
		135	—	—	12·5										
1105	0	0	—	—	14·8	—	—	—	—	—	**LH**	*ca.* 25	1230	1305	
		10	—	—	14·3	—	—	—	—	—	**BT**	75–0	1243	1250	
		20	—	—	12·9	—	—	—	—	—	**N 50 V**	75–0	1245	1251	Net split: catch retained
		30	—	—	12·9	—	—	—	—	—	**N 100 H**	5–0	1310	1330	
		50	—	—	12·8										
		75	—	—	12·8										
1106	1	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample
1107	2	—	—	—	—	—	—	—	—	—	—	—	—	—	Bottom sample. GMT = zone − 1 hr

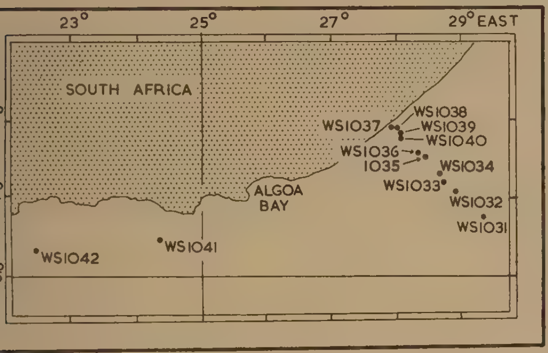
SUMMARIZED LIST OF STATIONS

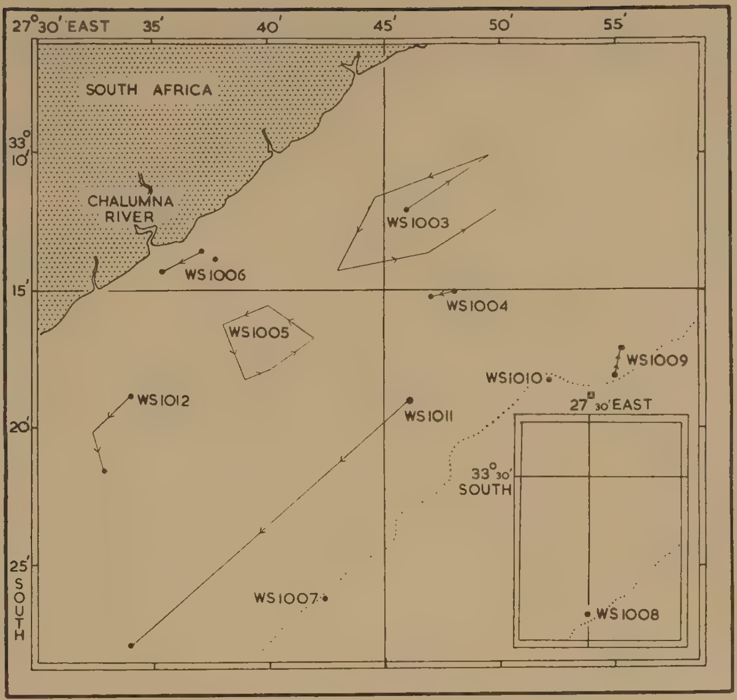
The positions of the stations made by the R.R.S. 'William Scoresby' between January and October 1950 are shown on the charts in Plates XI and XII. At the fishing stations off East London, the course of the trawls and positions of the long lines have been inserted appropriately. The following list indicates on which chart the stations are to be found:

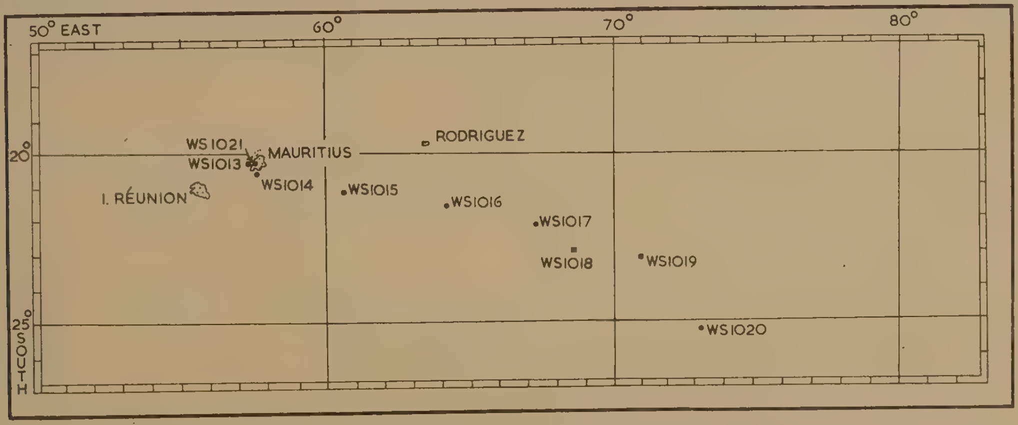
Stations	Date	Area	Plate
WS 960–963	18. i. 50–19. i. 50	South-west of Ireland	XII
WS 964–1002	4. iii. 50–14. iii. 50	Off South-West Africa	XI
WS 1003–1012	2. v. 50–10. v. 50	Off East London	XII
WS 1013–1021	27. vi. 50–16. vii. 50	Indian Ocean	XII
WS 1022–1030	27. vii. 50–4. viii. 50	South of Madagascar and Mozambique Channel	XII
WS 1031–1042	3. ix. 50–8. ix. 50	Off East London (Agulhas Current)	XII
WS 1043–1107	19. ix. 50–14. x. 50	Off South-West Africa	XI

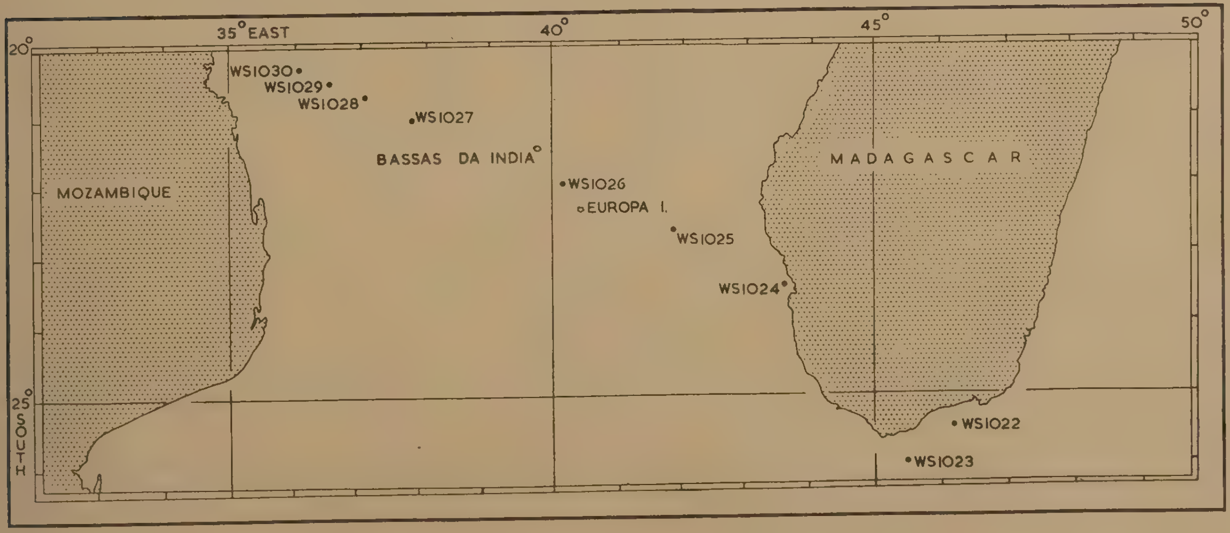

10° EAST
15°
20°
10°
15°
20°
25°
30°
35°
SOUTH
WS968
WS967
WS966
WS964
WS965
WS969
WS970
WS971
WS972
WS973
WS974
WS975
WS978
WS977
WS976
WS979
WS980
WS981
WS982
WS983
WS984
WS985
WS986
WS987
WS988
WS989
WS990
WS991
WS992
WS993
WS994
WS995
WS996
WS997
WS998
WS999
WS1000
WS1001
WS1002
WS1107
WS1106
WS1105
WS1104
WS1103
WS1102
WS1101
WS1100
WS1099
WS1098
WS1097
WS1096
WS1095
WS1093
WS1094
WS1091
WS1092
WS1087
WS1090
WS1086
WS1089
WS1084
WS1085
WS1088
WS1083
WS1082
WS1079
WS1077
WS1080
WS1075
WS1078
WS1076
WS1081
WS1074
WS1073
WS1068
WS1072
WS1066
WS1071
WS1067
WS1065
WS1070
WS1063
WS1069
WS1062
WS1064
WS1061
WS1060
WS1059
WS1058
WS1057
WS1051
WS1050
WS1056
WS1055
WS1052
WS1054
WS1053
WS1049
WS1048
WS1047
WS1046
WS1045
WS1044
WS1043


10°
5° WEST
IRELAND
WS961
WS963
WS960
WS962
IS. OF SCILLY


23°
25°
27°
29° EAST
SOUTH AFRICA
WS1038
WS1037
WS1039
WS1040
WS1036
1035
WS1034
WS1033
ALGOA BAY
WS1032
WS1031
WS1041
WS1042


27°30' EAST
35'
40'
45'
50'
55'
33° 10'
15'
20'
25'
SOUTH
SOUTH AFRICA
CHALUMNA RIVER
WS1003
WS1006
WS1004
WS1005
WS1009
WS1010
WS1012
WS1011
27° 30' EAST
33° 30' SOUTH
WS1007
WS1008


50° EAST
60°
70°
80°
20°
25° SOUTH
WS1021
WS1013
MAURITIUS
RODRIGUEZ
WS1014
WS1015
I. RÉUNION
WS1016
WS1017
WS1018
WS1019
WS1020


35° EAST
40°
45°
50°
20°
25° SOUTH
WS1030
WS1029
WS1028
WS1027
BASSAS DA INDIA
MADAGASCAR
MOZAMBIQUE
WS1026
EUROPA I.
WS1025
WS1024
WS1022
WS1023

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A PRELIMINARY REPORT ON THE OSTRACODA OF THE BENGUELA CURRENT

By

E. J. ILES

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A PRELIMINARY REPORT ON THE OSTRACODA OF THE BENGUELA CURRENT

By E. J. Iles, B.Sc., Ph.D.
Department of Zoology, The University of Manchester

(Text-figs. 1–5)

INTRODUCTION

The R.R.S. 'William Scoresby' carried out two surveys of the Benguela current in 1950, the first in March, and the second in September–October. Some of the results of these surveys have been briefly described by Hart (1953) and Currie (1953), but some time will no doubt be needed for the full analysis of the data, and especially for examination of the collections of plankton. Dr T. J. Hart has carried out the laborious task of sorting the samples of zooplankton, and at the invitation of Dr N. A. Mackintosh I undertook to examine and report upon the Ostracods. The sorting has been so effective that I have received all the material from the first survey, including the early juvenile stages. The present report is based on this material: that is to say it is limited to the first of the two surveys, and at this stage I have thought it best simply to give an account of the species identified, to note the numbers in which they occur in the samples, and to draw attention to certain aspects of their horizontal and vertical distribution. It is hoped that a report on these lines will materially assist a wider study of the fauna of the Benguela current and its relations to the hydrographic features of this interesting region.

With the exception of a very few species the planktonic Ostracods of the open sea belong to a single family, the Halocypridae. Previous marine expeditions have provided material that has made possible the recognition of what is probably the majority of the existing species of the family. A series of workers (Claus, Brady, Müller, Vavra, Sars, etc.) have worked out these collections but their descriptions are mainly limited to a few diagnostic features. More recently Skogsberg (1920, 1946) re-described certain species and drew attention to the inadequate nature of the previous descriptions. Although, as he pointed out, taxonomic revision of the family is clearly needed, re-description of many more species will be necessary before this can be done. However, I have decided that it would be preferable to postpone re-description of the species considered in this report until material with a much wider range of distribution has been examined. The species found in the samples have thus, with one exception, been determined and classified on the basis of existing taxonomic knowledge. They are listed below with the appropriate authorities. The juvenile stages of the Halocypridae have not been adequately described in the literature and therefore the early stages whose identity cannot yet be established have been listed as 'unidentified juveniles'. Numerical data regarding material from the samples are included in the tables, which form an appendix to this report.

I wish to acknowledge my indebtedness to the National Institute of Oceanography for the opportunity of examining the material. I should also record my sincere thanks to Dr Mackintosh for the trouble he has taken in reading through and checking the typescript, and to Dr Hart for the information he has supplied. Dr J. P. Harding of the British Museum (Natural History) has very kindly given me details of the type material of *Halocypris punica* Scott. Finally, I wish to thank Prof. H. Graham Cannon for introducing me to the field of study of Ostracod taxonomy and for his continued interest and advice during the progress of my work.

THE MATERIAL EXAMINED

The plankton samples of the first survey were taken on a series of three transverse lines of stations across the Benguela current off the coast of South-west Africa (Fig. 1).[1] These samples were taken with a series of vertical closing nets of the N 70 pattern shot to a maximum depth of 1000 metres or less, depending upon the depth of water at the station. The soundings show that the outermost station of each line was in a depth of water of some 2000 m. or 3000 m., while the lines then proceeded up the Continental Slope, a few stations in each being over the Continental Shelf.

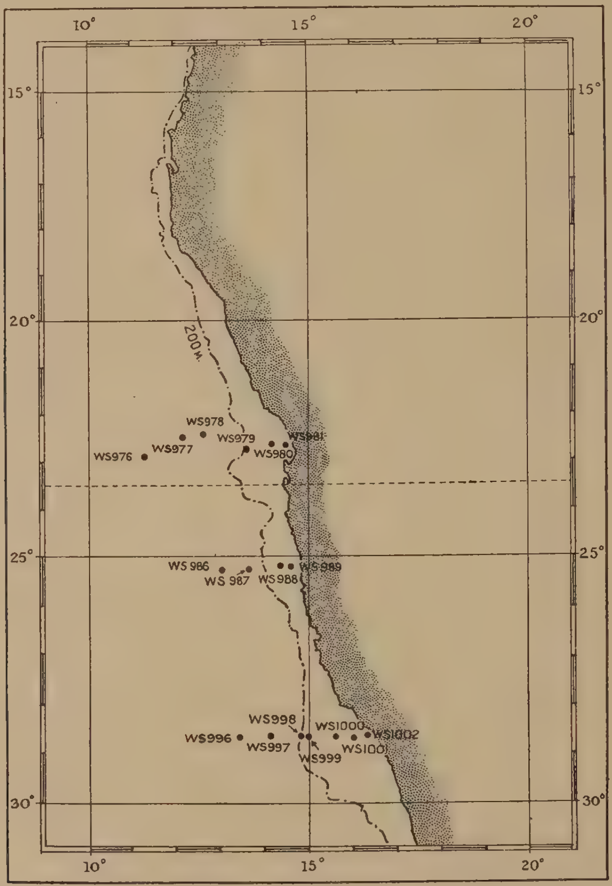
10°
15°
20°
15°
15°
20°
20°
200 M.
WS978
WS979
WS981
WS977
WS976
WS980
25°
25°
WS 986
WS 987
WS 988
WS 989
WS998
WS1000
WS1002
WS996
WS997
WS1001
WS999
30°
30°
10°
15°
20°

Fig. 1. Sketch-map of the area off the west coast of Africa where samples were taken, showing the approximate positions of the stations.

SPECIES PRESENT IN THE SAMPLES

Conchoecia rotundata Müller aff.

Skogsberg (1920) pointed out that the species *C. rotundata* as described by Müller (1906) is probably a mixture of closely allied species, and the material from the Benguela current has made it possible to confirm this hypothesis.

Müller (1890) described the species *C. rotundata* on the basis of a few specimens obtained in deep water at two positions in the tropical Pacific. These were in 13° N., 120° W. at a depth of 1000 m., and in 1° S., 100° W. at 4000 m. (According to Schott (1935, pp. 199–203) the temperatures at these depths were 4·60° C. and 1·85° C. respectively). The description was brief and even failed to give adequate details of the unsymmetric glands. The same author (1894) ascribed material from the Mediterranean to the same species. The length of typical specimens in this material was only 0·8 mm. as opposed to 1·15 mm. in the case of the Pacific material, and there were fewer pairs of spines on the principal seta of the male antennule (eight instead of ten). The frontal organ of the male also differed.

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[1] Particulars have now been published in a new Station List in the Discovery Reports.

The 'Valdivia' Expedition provided a large quantity of material from the Atlantic and Antarctic including species allied to *C. rotundata*, which Müller (1906) distinguished and named. It included material which resembled his previous specimens of *C. rotundata*, and also longer specimens (up to 1·75 mm. in length) with similar features, such as the position of the unsymmetric glands. He included the longer forms in the same species. He noted that the 'long forms' were typical of the Antarctic and the 'short forms' of warmer waters, but assumed that he was dealing with a very variable species.

Fowler (1909), while studying the planktonic Ostracoda of the Bay of Biscay, obtained specimens of both the 'long' and 'short forms'. He interpreted the two 'forms' on the basis that the 'long forms' were adult and the 'short forms' juveniles of the same species.

Further material from the Antarctic was examined by Skogsberg (1920). He obtained specimens of the 'long forms' and described them in some detail, noting that they agreed with the 'long forms' described by Müller. He did not find any of the 'short forms', considered that Fowler was mistaken in supposing them to be juveniles, and decided that they belonged to a nearly related species, possibly *C. nasotuberculata*. He concluded in fact that Müller's *C. rotundata* might be a mixture of closely allied species.

The samples collected by the 'William Scoresby' in the Benguela current provide further material of both the 'long forms' and the 'short forms' of *C. rotundata* as described by Müller (1906). Both these 'forms' occur at the same stations and in some instances in the same samples. There are fully matured male and female specimens and also juveniles of each type. The use of closing-nets and the numbers of adults of each form in each sample shows that there is a clear difference in their depth distribution. Table 1 gives the total number of 'short forms' of *C. rotundata* taken at the different stations, and the proportion collected at depths above 250 m. is compared with the figures for the 'long forms' and for *C. nasotuberculata*. Only one specimen from a total of twenty-three 'long forms' was captured above 250 m., whereas many more 'short forms' occurred in samples taken above 250 m. than below. *C. nasotuberculata*, clearly distinguishable morphologically from the 'short forms', occurs in the same samples. Its depth distribution (Table 1) falls somewhat between that of the two 'forms' under consideration.

Table 1. *Comparative depth distribution of 'long' and 'short forms' of* C. rotundata *and* C. nasotuberculata

Station	'Short forms'			'Long forms'		*C. nasotuberculata*		
	Total No.	Above 250 m.		Total No.	Above 250 m.	Total No.	Above 250 m.	
		No.	%		No.		No.	%
WS 976	73	47	64	1	0	21	1	5
WS 977	23	21	91	7	0	47	21	45
WS 978	9	7	78	5	0	36	3	8
WS 980	1	1	100	0	0	0	0	0
WS 986	7	6	86	7	0	39	7	18
WS 996	9	8	89	2	1	9	3	33
WS 997	2	2	100	0	0	1	0	0
WS 998	1	1	100	0	0	0	0	0

An examination of the material shows clear morphological differences between the two 'forms'. Specimens of the 'long form' agree in structure with those described by Skogsberg (1920) from his Antarctic material. The 'short forms' agree in structure with the material from the Mediterranean described by Müller (1894) as *C. rotundata.*

As Skogsberg (1920) has pointed out, the form of the shell is a characteristic feature of the species of *Conchoecia*. This differs markedly in the two 'forms' considered here. The 'long forms' have a greater ratio of length to depth and their greatest depth is anterior to the middle of the length, as opposed to posterior in the 'short forms'. They have, in the material so far examined, a length of 1·4 mm. or more, as opposed to 0·8–0·9 mm. in the case of the 'short forms'. Although the form and spacing of the spines of the principle ('*e*') seta of the male antennule is similar in the two, the 'long forms' have 14–15 pairs whereas the 'short forms' have 9–10 pairs. The clasping organ of the endopodite of the right male antenna in the 'short forms' is similar to that of *C. kyrtophora* or *C. nasotuberculata*, being sharply angled rather than smoothly curved as in the case of the 'long forms'. The frontal organ of the male is similar in the two but the 'long forms' have a dorsal insection which is absent in the 'short'.

Through the kindness of the authorities of the British Museum (Natural History), it has been possible to re-examine Fowler's material from the Bay of Biscay. His stage I of *C. rotundata* agrees with the 'long forms' and his stage II with the 'short forms'.

It is clear that the two 'forms' are separate species, the 'short form' typical of the Mediterranean and warmer waters of the Atlantic, the 'long form' characteristic of the Antarctic and colder water, at least in the Atlantic. The problem of specific identity remains. Both these species have previously been ascribed to *C. rotundata* Müller. The original description (Müller, 1890) is inadequate even in respect to diagnostic characters. On the basis of the described and figured outline of the shell and the ten pairs of spines on the principal seta of the male antennule, together with the length of 1·15 mm. as opposed to 1·4 mm. or more in the 'long forms', it is clear that the latter are specifically distinct and must be renamed. Morphological differences between the 'short forms' and the type description of *C. rotundata* are slight and may or may not be significant. The length of the specimens under consideration, as well as that of Müller's Mediterranean material, is less than that of his Pacific material. The shape of the male frontal organ in the original description more nearly resembles that of the 'long forms'. It would therefore seem preferable to treat the two 'forms' as distinct species.

Müller (1912) included *Halocypris punica* Scott (1894) as a possible synonym of *Conchoecia rotundata* and it is necessary therefore to consider the possibility of this name being applicable to either species. As Skogsberg (1920) has pointed out, the original description is of a specimen differing so much that it is unlikely to be a synonym of *C. rotundata*. Dr J. P. Harding of the British Museum has very kindly examined the type material. The tube contains the shell of the animal described by Scott, together with other obviously unrelated material. It is clear that it differs so widely that it cannot be the same species as either *C. rotundata* or the two species considered here.

The specific name *C. rotundata* should thus, for the present, be restricted to the Pacific material described by Müller (1890, p. 275, pl. XXVIII, figs. 41–3; pl. XXIX, fig. 44). The other two species have been named as follows:

Conchoecia skogsbergi n.sp. ('long forms').

C. rotundata (part) Müller, 1906, p. 83 (part); pl. XVII, figs. 25–9 (not 23–4); (?)figs. 30–4.
C. rotundata (Stage I) Fowler, 1909, p. 273; pl. 23, fig. 206; pl. 24, figs. 205, 215.
C. rotundata (part) Müller, 1912, p. 77.
C. rotundata Skogsberg, 1920, p. 649 *et seq.*; figs. CXXII and CXXIII.

The description and figures given by Skogsberg (1920, p. 649) under the name *Conchoecia rotundata* may be taken as typical for this species. Type material will be deposited at the British Museum. The distribution known at present is in the Antarctic and colder waters of the Atlantic, distribution northwards possibly being due to the cold Benguela current. In the present series of samples moderate numbers of adults and juveniles occurred at Stations WS 976–8, 986 and 996 mainly at depths below 250 m. A single juvenile was in the 500–250 m. sample from Station WS 997.

The species may be distinguished from other known species of the genus *Conchoecia* by the shape of the shell coupled with the position of the unsymmetric glands. Confirmatory characters of the male are the number of pairs of spines on the principal seta of the antennule, the form of the clasping organ of the antenna and the frontal organ.

The new specific name has been chosen in acknowledgement of Skogsberg's realization that more than one species might have been confused under the name *C. rotundata*.

Conchoecia teretivalvata n.sp. ('short forms').

C. rotundata Müller, 1894, p. 229; pl. 16, figs. 16, 18–20 (not fig. 17); pl. 8, fig. 33.
C. rotundata Müller, 1906, p. 83 part.
C. rotundata (stage II) Fowler, 1909, p. 273.
C. rotundata (part) Müller, 1912, p. 77.

DIAGNOSTIC DESCRIPTION. *Male.* Length 0·8–0·9 mm. Shell (Fig. 2*a*) resembling that of *C. kyrtophora* in profile, but with the shoulder vaults poorly developed and the whole surface smoothly convex as in the case of *C. skogsbergi*. The posterior dorsal angle is strongly obtuse, the posterior margin being convex and continuing smoothly into the ventral margin. The greatest depth of the shell valves is just posterior to the middle of the length, and the depth decreases sharply anterior to this point. The left unsymmetric gland (Fig. 2*b*) is situated near the base of the rostrum, just posterior to the anterior extremity of the hinge. The right unsymmetric gland (Fig. 2*c*) opens level with the margin of the shell near the posterior extremity of the hinge, there being no tubercle. Medial glands are moderately well developed. Striation of the shell is similar in arrangement to that of *C. nasotuberculata* but very weak and difficult to observe.

The principal ('*e*') seta of the antennule (Fig. 3*c*) has nine or ten pairs of spines arranged in two rows with the spines of each pair level with one another. Each spine is sharply basally directed, parallel to the seta. The more basal spines are slightly longer than the more distal and the three most basal pairs succeed one another at wider intervals than the distal pairs. The proximal setae have a few extremely fine distally directed setules level with the distal spines of the principal seta.

The endopodite of the antenna closely resembles that of *C. skogsbergi* (see Skogsberg, 1920, under *C. rotundata*) but the clasping organs differ. The right clasping organ (Fig. 3*b*) is bent at a right-angle and has the apical portion slightly recurved. It has well-marked transverse striae distally. The left clasping organ (Fig. 3*a*) is smoothly curved and slightly recurved at the apex. The apical transverse striae are indistinct.

The dorsal boundary of the capitulum of the frontal organ (Fig. 2*d*) is slightly and smoothly concave. Basally it is considerably swollen, which portion bears a few conspicuous ventral spines.

Female. Length about 0·9 mm. The shell (Fig. 2*f*) resembles that of the male in general features though it has a greater depth in proportion to its length. It lacks the well-marked shoulder vaults and posterior tubercle, which are present in the similar species, *C. kyrtophora* and *C. nasotuberculata*.

The frontal organ (Fig. 2*e*) has a capitulum with a length slightly more than four times the breadth, and slightly tapering anterior to the middle of its length. The apex is rounded and the whole ventral margin bears short fine spines.

Present knowledge indicates that the distribution of this species is in the Mediterranean and the warmer waters of the Atlantic. In the Benguela current samples it occurred at Stations WS 975–8, 980, 986 and 996–8, with a much larger number of specimens in samples above 250 m. than below.

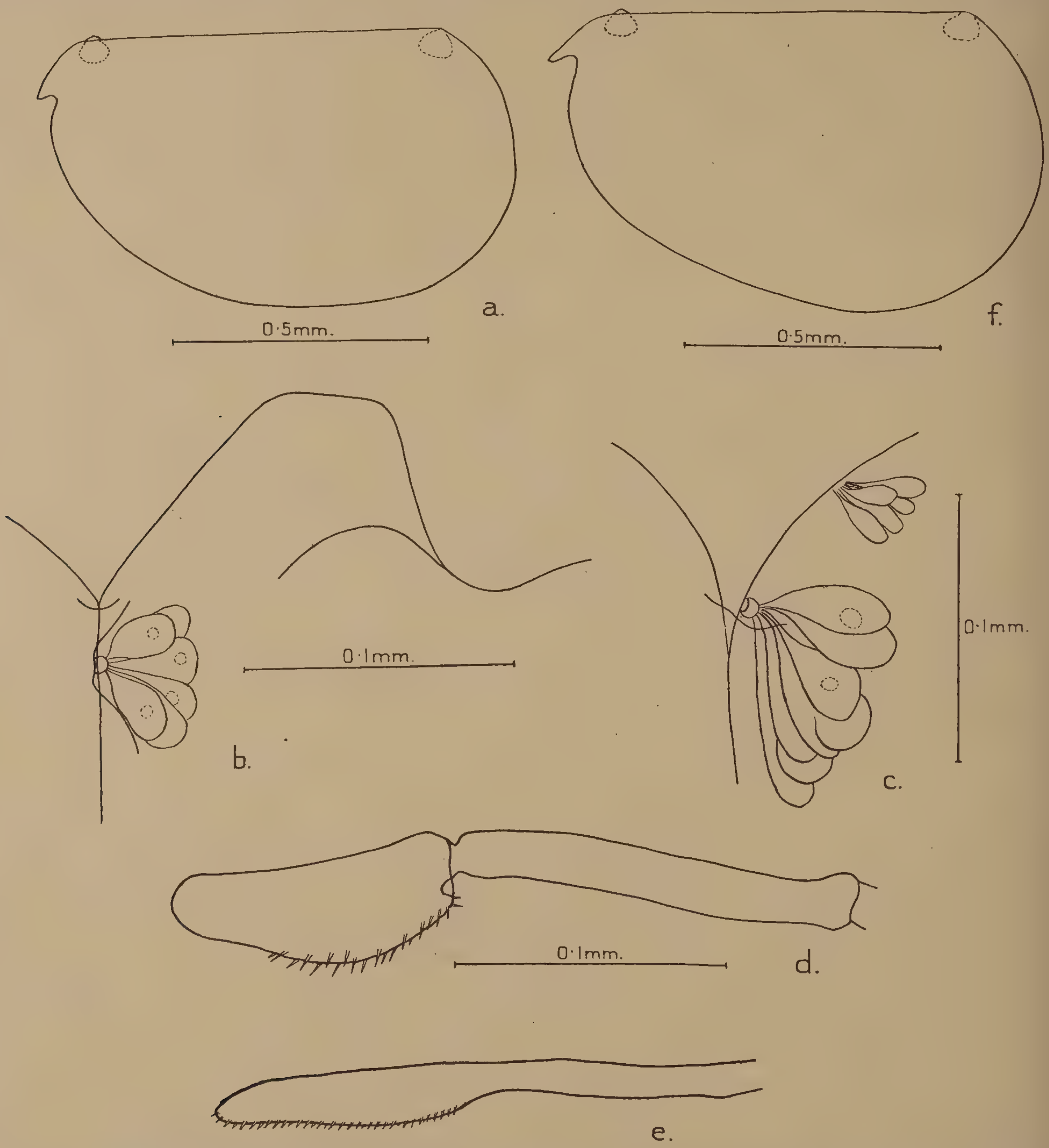


Fig. 2. *C. teretivalvata* n.sp. *a*, male from left side; *b*, anterior (left) unsymmetric gland of male from inside the shell; *c*, posterior (right) unsymmetric gland and medial gland of male from inside the shell; *d*, frontal organ of male; *e*, frontal organ of female; *f*, female from left side. (Figs. *b*, *c*, *d* from holotype; *a*, *e* and *f* from paratypes.)

The species may be distinguished from other species of the genus, except *C. rotundata* Müller, by the form of the shell coupled with the position of the unsymmetric glands. As far as is known, it differs from *C. rotundata* morphologically in its size, and in the form of the male frontal organ, as well as in its distribution.

Other species present in the samples were as follows:

Conchoecia alata Müller.

Conchoecia alata Müller, 1906, p. 121; pl. 29, figs. 1–10.
C. alata Müller, 1912, p. 92.

Numerous specimens at Stations WS 976–8, 986, 996, 997.

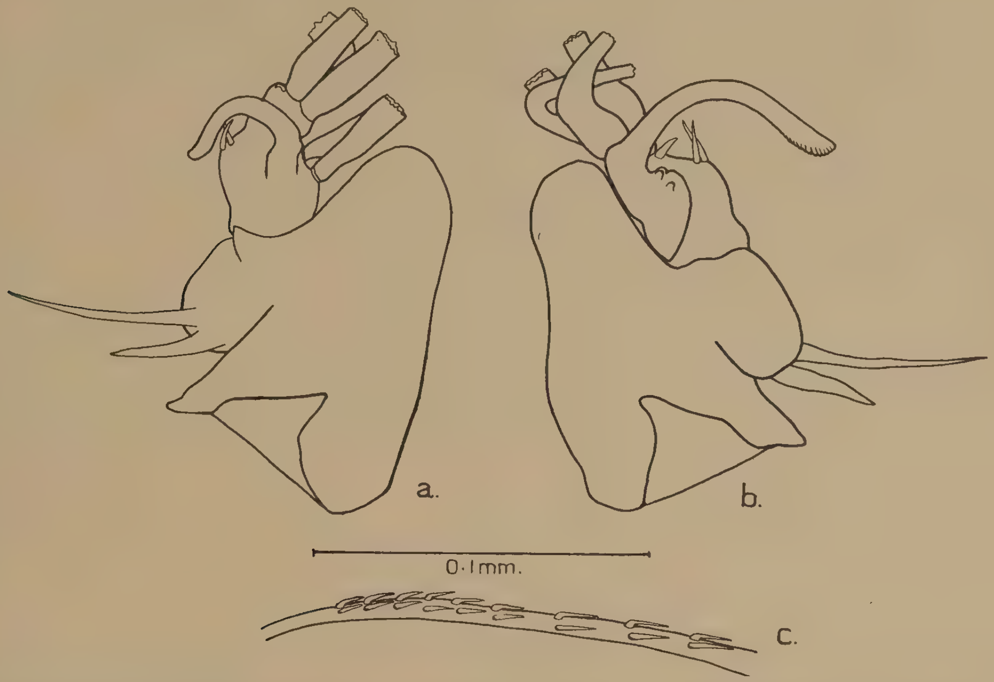


Fig. 3. *C. teretivalvata* n.sp. *a*, exopodite of male left antenna; *b*, exopodite of male right antenna; *c*, armature of principal seta of male antennule. (All from holotype.)

Conchoecia bispinosa Claus.

For synonymy and description see Skogsberg, 1920, p. 672, fig. CXXVIII.

This species occurred in samples from stations WS 976, 986, 996 and 997. Skogsberg (1920) has pointed out the close resemblance between this species and *C. haddoni* Brady & Norman. The two species are distinguishable by the short spines on the posterior dorsal angle of the shell of *C. bispinosa* and the number of spines on the principal setae of the first antennae of the males. Skogsberg states (1920, p. 675) that the areas of distribution of the two species do not coincide. Müller (1906, 1908), however, recorded the two species from the same plankton samples, and in the samples at present under consideration they also occur together. There must then be at least an overlap in their distribution.

Conchoecia chuni Müller.

For synonymy and description see Skogsberg, 1920, p. 636, fig. CXIX.

A single adult female occurred in the 250–100 m. sample from Station WS 996.

Conchoecia curta Lubbock.

The synonymy of this species is extremely complex and uncertain. Skogsberg (1920) discussed the position and re-described the species. The material from the Benguela current first survey clearly falls within the scope of the species as described by him. It was present in large numbers, of both adults and juveniles, in samples from Stations WS 976, 978, 986, 996 and 997. A single juvenile was found in the 100–50 m. sample from Station WS 1001. It clearly formed a major part of the Ostracod fauna in the area at the time when the samples were taken. Certain features of its distribution will be discussed later in this report.

Conchoecia daphnoides (Claus).

For synonymy and description see Skogsberg, 1946, pp. 20–4, fig. V, 1–4.

An adult female of this species was found at Station WS 986 and single adult males at Stations WS 996 and 997. A juvenile was found at Station WS 976. All specimens were in the 750–500 m. samples.

Conchoecia echinata Müller.

Conchoecia echinata Müller, 1906, p. 61; pl. 10, figs. 14–24.
C. notocera Vavra, 1906, p. 58; pl. 6, figs. 114–20.
C. echinata Müller, 1908, p. 3.
C. echinata Müller, 1912, p. 70.

Present at Stations WS 976–8, 986, 996 and 997

The previously recorded range of this species extends from 31° N. (Vavra, 1906) to 14° S. (Müller, 1908) in the Atlantic. The material from the Benguela current stations extends the range of the species further south.

Conchoecia edentata Müller.

Conchoecia edentata Müller, 1906, p. 76; pl. XV, figs. 24–9.
C. edentata Müller, 1912, p. 74.
C. edentata Barney, 1921, p. 183–4, fig. 5.

A single female of this species was found in the 500–250 m. sample from Station WS 976.

The species was initially described by Müller (1906) on the basis of a single male and a juvenile female, which latter he did not describe. Barney (1921) found two males and two females which he ascribed to the species and gave a brief description of the female. All these previous specimens were found in the Antarctic. The present specimen agrees so closely with the previous descriptions as to warrant inclusion in the species. It is, however, further north than previously recorded.

Conchoecia elegans Sars.

For synonymy and descriptions see Skogsberg, 1920, p. 624, figs. CXVII and CXVIII, and Sars, 1928, p. 23, pls. XI and XII.

A large proportion of the specimens found in the samples belongs to this species. It was found at Stations WS 976–8, 986, 996–8. Its distribution will be discussed in more detail later in this report.

Conchoecia haddoni Brady & Norman.

For synonymy and description see Skogsberg, 1920, p. 668; fig. CXXVII.

A few specimens were present in the samples, most of them from Station WS 996. Single adult females were found at Stations WS 976 and 997, as were also single juveniles. See also remarks under *C. bispinosa* above.

Conchoecia hirsuta Müller.

Conchoecia hirsuta Müller, 1906, p. 60; pl. 11, figs. 1–3 and 6–10; 1908, p. 69; 1912, p. 66.

A single male of this species was found in the 1000–750 m. sample at Station WS 986.

Conchoecia lophura Müller.

For synonymy and description see Skogsberg, 1920, p. 689, fig. CXXXI.

Single adults of this species were present in samples from Stations WS 976, 986 and 997. There were two juveniles in samples from WS 986 and one from Station WS 996.

Conchoecia loricata (Claus).

Conchoecissa loricata Claus, 1894, p. 4; pl. 3, fig. 24–30.
Conchoecia loricata Müller, 1906, p. 95; pl. 22, figs. 1–9.
C. loricata loricata Müller, 1912, p. 80.

A few specimens of adults and juveniles of this species occurred in samples taken below 250 m. at Stations WS 976–8, 986, 996 and 997.

Müller (1906) distinguished two varieties of the species, which he called var. *typica* and var. *minor*. The latter differed from the former in being smaller, having only twelve pairs of spines on the proximal seta of the antennule instead of about twenty-two, and having less marked striae on the shell. In a later publication (1912) he refers to the former as *C. loricata loricata*. The present material would appear to fall within the scope of *C. loricata loricata* though it has fewer spines on the proximal seta. The range of variation and status of the 'varieties' cannot be determined before a considerably greater bulk of material has been examined.

Conchoecia macromma Müller.

Conchoecia macromma Müller, 1906, p. 79; pl. 17, figs. 11–22.
C. macromma Müller, 1912, p. 75.

A single adult female of this species was present in the 1000–750 m. sample from Station WS 986.

Conchoecia mamillata Müller.

Conchoecia mamillata Müller, 1906, p. 60; pl. 16, figs. 1–9; pl. 35, fig. 8.
C. mamillata Müller, 1912, p. 70.

A single adult female was found in the 1000–750 m. sample from station WS 976.

(?) **Conchoecia mollis** Müller.

Conchoecia mollis Müller, 1906, p. 106; pl. 24, figs. 1–10 and 13.
C. mollis Müller, 1912, p. 85.

A single adult female was found in the sample collected between 1000 and 750 m. at Station WS 996, which if not *C. mollis* itself is closely related to it. Existing descriptions only make it possible to distinguish the males of the group of species allied to *C. mollis*, and until more detailed descriptions of the females are available, doubt must remain regarding the identity of this particular specimen.

Conchoecia nasotuberculata Müller.

Conchoecia nasotuberculata Müller, 1906, p. 83; pl. 18, figs. 25–30.
C. nasotuberculata Müller, 1912, p. 76.

This species occurred in large numbers at Stations WS 976–8, 986, 996 and 997. Distributional data of this species will be discussed later in the report.

Conchoecia obtusata Sars var. *antarctica* Müller.

For description and synonymy see Skogsberg, 1920, p. 647.

The species occurred in moderate numbers at Stations WS 976, 977, 996, 997 and 998. The previously recorded range of distribution of the species was in the Atlantic from 53° S. (Skogsberg, 1920) to 26° S. (Müller, 1906). The present records thus extend the distribution in the Benguela current further north to 22° 39′ S. Müller (1906, p. 149) considered that although the variety is typically Antarctic in its distribution its range is extended northward by the cold Benguela current. The present records are not then surprising.

Conchoecia procera Müller.

Conchoecia variabilis (part) Müller, 1890, p. 273; pl. 28, figs. 27, 38.
C. procera Müller, 1894, p. 228; pl. 6, figs. 47, 48, 50–8.
Paraconchoecia oblonga Claus, 1894, p. 3; pl. 3, figs. 21–3.
C. procera Müller, 1906, p. 71; pl. 13, figs. 37–47; pl. 14, figs. 3–6.
C. procera Müller, 1912, p. 72.

A few adults of this species were found in samples from Stations WS 976 and 996. A single juvenile was found in the 500–250 m. sample from Station WS 977.

Conchoecia spinifera (Claus).

Paraconchoecia spinifera Claus, 1890, p. 14.
P. spinifera Claus, 1891, p. 64; pl. 10.
Conchoecia spinifera Müller, 1906, p. 56; pl. 9, figs. 1–10, 14, 15.
C. spinifera Müller, 1912, p. 69.

A single adult female occurred in the 500–250 m. sample from Station WS 996 and a single adult male in the 500–250 m. sample from Station WS 976.

Conchoecia subarcuata Claus.

For description and synonymy see Skogsberg, 1920, p. 695 and fig. CXXXIII.

Moderate numbers of this species were present in the samples from Stations WS 976–8, 986, 996 and 997.

Conchoecia symmetrica Müller.

For description and synonymy see Skogsberg, 1920, p. 719 and figs. CXXXVIII–CXLIV.

Moderate numbers were present in samples from Stations WS 976–8, 986, 996 and 997.

Halocypris brevirostris (Dana).

For description and synonymy see Skogsberg, 1920, p. 584; figs. CXII–CXV.

A single juvenile of this species was found in the sample from 250–100 m. at Station WS 997.

Cypridina sp.

A single unidentified juvenile of the genus *Cypridina* was found in the 250–100 m. sample from Station WS 978.

DISTRIBUTION OF SPECIES

Owing to the wide range of variables involved in the present limited series of samples available, it is not yet possible to interpret the distribution of species fully. As Fowler (1909) has pointed out there is an almost hourly variation in the distribution of Ostracods. Some numerical data are, however, worthy of note. Only adults will be considered, since outstanding taxonomic problems regarding the juvenile stages make a complete analysis of these stages impossible at present. The data only refer to the time and conditions when the samples were taken.

Table 2 shows the total numbers of adults of each species captured at each station. The first striking feature is the large number of species of Halocyprids present in such a limited area. The second is the vast preponderance of *Conchoecia elegans*. Müller (1927), Elofson (1941) and others pointed out the cosmopolitan nature of this species, so that its presence is not surprising, but its large numbers will require explanation when further data become available. *C. curta*, *C. nasotuberculata* and *C. teretivalvata* were also present in large numbers. Though *C. alata* was less numerous, it occurred in sufficient numbers to form an appreciable proportion of the material, particularly in samples between 250 and 750 m. Other species were much less numerous, but some occurring in total numbers of from sixteen to twenty-five were sufficiently evenly distributed to be considered typical of the particular series of samples. In the case of *C. bispinosa*, although a total of twenty-eight adults was found in the samples, nineteen of these were from 500–250 m. and 750–500 m. samples from Station WS 976. It would seem that when the samples were taken at this daylight station there may have been a localized swarm of this species.

Table 2. *The sounding and total numbers of adults of each species captured at each station*

WS Station	Sounding (m.)	*C. alata*	*C. bispinosa*	*C. chuni*	*C. curta*	*C. daphnoides*	*C. echinata*	*C. edentata*	*C. elegans*	*C. haddoni*	*C. hirsuta*	*C. lophura*	*C. loricata*	*C. macromma*	*C. mamillata*	*C. mollis* aff.	*C. nasotuberculata*	*C. obtusata*	*C. procera*	*C. skogsbergi*	*C. spinifera*	*C. subarcuata*	*C. symmetrica*	*C. teretivalvata*
976	ca. 3098	20	20	0	68	0	14	1	177	1	0	2	2	0	1	0	21	9	4	1	1	6	5	73
†977	1970*	18	0	0	2	0	5	0	192	0	0	0	1	0	0	0	47	1	0	7	0	4	1	23
†978	932	19	0	0	1	0	1	0	78	0	0	0	1	0	0	0	36	0	0	5	0	3	0	9
979 980 981	139 106 64	One adult *C. teretivalvata* at Station 980																						
986	>1000	4	2	0	10	1	2	0	118	0	1	1	3	1	0	0	39	0	0	7	0	2	2	7
987 988 989	293 135 70	No adult Ostracods																						
996	2586*	3	3	1	20	1	2	0	134	8	0	0	1	0	0	1	9	5	1	2	1	0	3	9
997	1075–983	2	3	0	13	1	1	0	14	1	0	1	0	0	0	0	1	10	0	0	0	3	5	2
998	198	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
999 1000 1001 1002	171 188 121 69	No adult Ostracods																						

* Soundings not at actual station but nearby.
† Omitting duplicate samples and those in which the net failed to operate correctly.

As has been pointed out above, *C. echinata* has now been found south of its previously recorded range of distribution and *C. obtusata antarctica* north of its previously recorded range. *C. teretivalvata*, a species typical of warmer waters, is present in the samples nearer the surface, and *C. skogsbergi*, typical of colder waters, is present in deeper samples. These instances are probably a result of the influence of the Benguela current.

Two previous expeditions, the 'Valdivia' (Müller, 1906) and the German South Polar (Müller, 1908), obtained plankton samples from the Benguela current in latitudes similar to those of the present series but further from the coast. All the species recorded here, with the exception of *C. echinata* and *C. obtusata antarctica*, were recorded by these expeditions. It is of interest to compare the species occurring in the Benguela current with those described from the east coast of Africa (Cannon, 1940). Cannon recorded *C. alata* and *C. atlantica* as the most numerous species. The second of these is totally absent from the present series of samples, though it is known to occur in similar latitudes out in mid-Atlantic.

The data given in Table 2 show the significant fact that along each line of stations, with a few minor exceptions, the nearer the stations were to the coast the fewer the number of adults of each species captured. At those stations where the sounding was less than 200 m., a single adult *C. teretivalvata* was captured at Station WS 980, and at Station WS 998 (near the edge of the Continental Shelf) single adults of *C. elegans*, *C. obtusata* and *C. teretivalvata* were taken in a 175–100 m. sample. Otherwise no adults were present. The comparatively small depth of water over the Continental Shelf will naturally limit the spread of those species which only occur in deeper water, though of course there may be other reasons for the scarcity of Ostracods in shallow water. An absence of specimens in the samples, however, does not necessarily indicate a complete absence of a species from the area in which the sample was taken. A comparison of the number of adults present in the 50–0 m. and 100–50 m. samples in the deeper water stations with the number in similar samples taken over the Continental Shelf shows marked differences. Thus in the six 50–0 m. samples taken at stations where the sounding was 932 m. or more, a total of 105 adults was found, an average of over seventeen per sample, and neglecting *C. elegans* at Station WS 977, for reasons which will be pointed out later, there was a total of twenty-two adults, an average of almost four per sample. Only two of the six samples were devoid of adult specimens. On the other hand, in twelve similar samples taken at stations where the sounding was 293 m. or less, there was not a single adult Ostracod. In six samples from the 100–50 m. net, taken at stations where the sounding was 932 m. or more, there was a total of forty-three adult Ostracods, an average of about seven per sample. Only one sample contained no specimens, while in nine similar samples taken at stations with soundings of 293 m. or less, a single adult specimen was found.

It appears, therefore, that although under the conditions when the samples were taken adult Ostracods occurred near the surface at stations where the water was deep, at the shallower water stations over the Continental Shelf there must have been some factor or factors (connected for example with temperature or water movements) which limited their spread.

DEPTH DISTRIBUTION

Although Fowler's work (1909) in the Bay of Biscay is marred (as pointed out by Skogsberg, 1920) by a number of taxonomic errors, it is still clear from his results that in a number of species of the Halocypridae there is a vertical nocturnal migration, and that each species has an optimum depth of occurrence in particular conditions. Certain species in the present series of samples occur in sufficient numbers to indicate similar results. A graphical representation of the depth distribution of the adults of these species is given in Figs 4 and 5. (These figures are corrected for the differing lengths of the column through which the nets were hauled.) In the case of *C. elegans* (Fig. 4) it is clear that the distribution of the species is centred around a depth of from 250 to 500 m. At Station WS 977 a large number of specimens were found in the 50–0 m. sample, indicating a swarm of a part of the population near to the surface. This station was worked at night, while the neighbouring Stations WS 976 and 978, where this phenomenon is not found, were worked during the day. This then would indicate that a nocturnal migration to the surface might be taking place. Similarly at Station WS 986 and 996 in daytime the majority were at 250–500 m., while at WS 997 at night, though the catch was small, there is evidence of a movement towards the surface. Fowler (1909) does in fact show such a migration for this species.

C. nasotuberculata (Fig. 5) and *C. curta* (Fig. 4) also show a depth distribution centred about 500–250 m. or rather less, though, in the latter case, the numbers are only sufficient at Stations WS 976 and 996 to indicate this. The rise in numbers of *C. nasotuberculata* above 250 m. at Station WS 977 may indicate a vertical migration, but in neither species is there a clear indication of such a migration as in the case of *C. elegans*.

The numbers of *C. alata* were much smaller but as will be seen from the Appendix (pp. 276–8), the majority of those specimens captured were in the 500–250 and 750–500 m. samples. This indicates a distribution around a level of about 500 m., or rather deeper than in the case of the three species already considered.

C. teretivalvata occurred in moderately large numbers (Fig. 5). Here the indications are that this species is distributed around a depth of 250–100 m., or at a much less depth than the other species considered. A large number of adults of the species occurred in the 750–500 m. sample at Station WS 976, but on the basis of the data available no explanation can be offered for this. There are some indications of nocturnal migration to the surface at Station WS 977.

Some of the species such as *C. symmetrica* occur in large numbers at depths of 1000 m. or more; hence the small numbers of these species in the samples may be due to the absence of samples from depths of more than 1000 m. It seems that, at the time when the samples were taken, the majority of the species found in moderate numbers in the samples had a greatest density of population at depths between 250 and 750 m.

SUMMARY

The Ostracod material from samples collected by the 'William Scoresby' during a first survey of the Benguela current (March 1950) has been examined. Twenty-three species of the genus *Conchoecia* have been identified and numbers of adult males and females as well as juveniles determined for each species. Single juveniles of *Halocypris brevirostris* and a *Cypridina* sp. were also present.

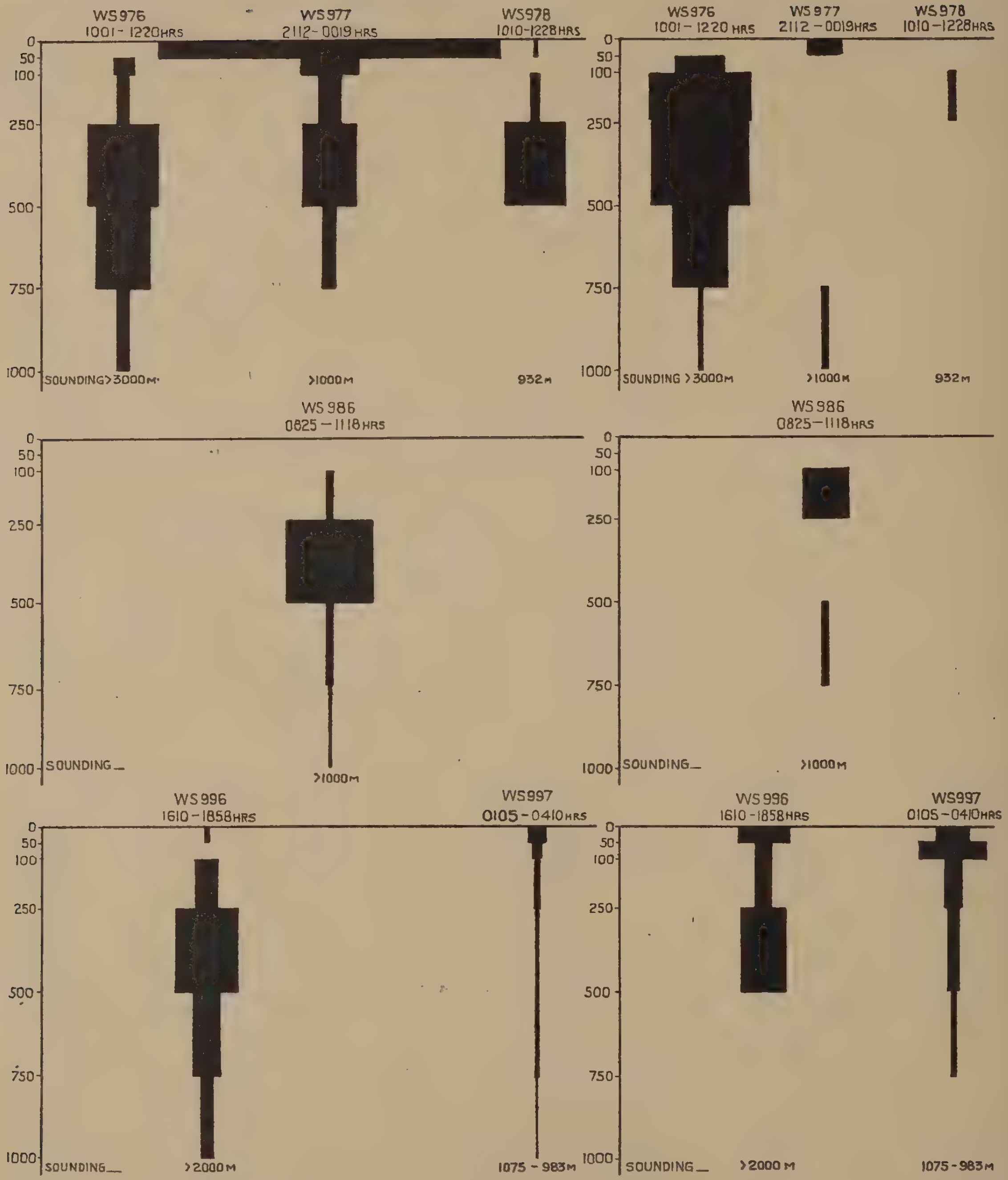
Data regarding depth distribution obtained by means of closing-nets, together with morphological examination, has made it possible to conclude that the Ostracods described previously under the name *Conchoecia rotundata* Müller are probably three closely allied species. Two of these species present in the Benguela current have been re-named.

An almost complete absence of specimens has been noticed in samples taken over the Continental Shelf. This is in contrast to the presence of quite a number of specimens of several species in samples taken at similar depths at deeper water stations.

A few species were present in sufficient numbers to obtain indications of their depth distribution.

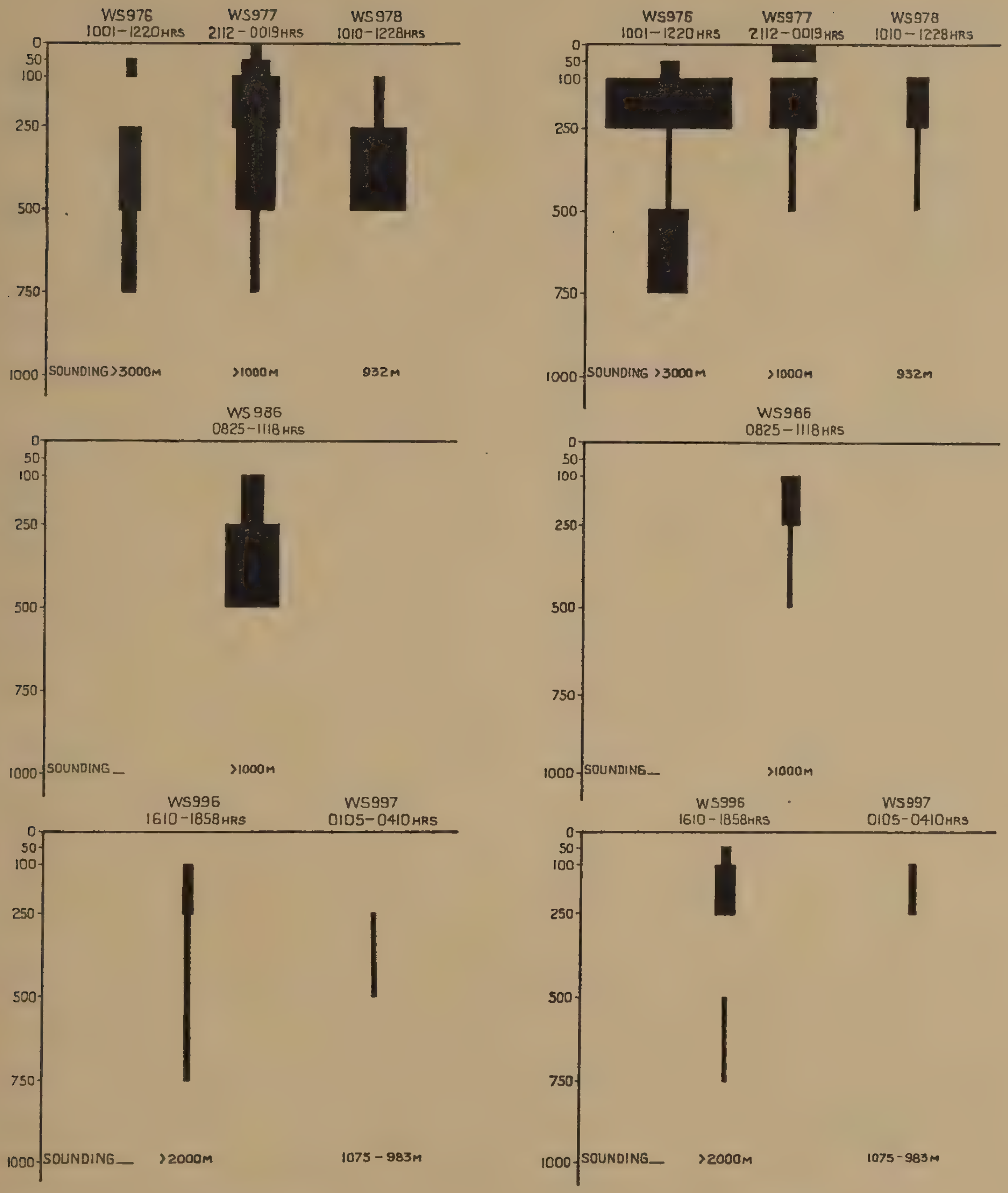
There is evidence of a nocturnal migration towards the surface in *C. elegans* Sars.

C. echinata Müller and *C. obtusata* Sars var. *antarctica* Müller have been found south and north of their previously known areas of distribution respectively.



C. elegans *C. curta*

Fig. 4. Diagram to illustrate the depth distribution of *C. elegans* and *C. curta* on the basis of average numbers of adults of each species for each 50 m. of depth in each sample. The horizontal scale is the same for all diagrams of any one species but differs for different species.



C. nasotuberculata

C. teretivalvata

Fig. 5. Diagrams constructed as Fig. 4 to illustrate the depth distribution of *C. nasotuberculata* and *C. teretivalvata*.

APPENDIX

Station WS 976. Date 6. iii. 50. Position 22° 50′ S., 11° 38′ E. Time 10 01–12 20 hr. Sounding 3098 m. 50–0 m. sample contained no Ostracods.

	100–50 m.			250–100 m.			500–250 m.			750–500 m.			1000–750 m.		
	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.
C. alata	0	0	0	0	0	0	9	0	8	5	4	10	2	0	0
C. bispinosa	0	0	0	1	0	3	3	5	10	8	3	6	0	0	0
C. curta	1	2	2	11	7	13	17	12	11	8	9	13	1	0	1
C. daphnoides	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
C. echinata	0	0	0	1	0	1	2	7	5	3	1	5	0	0	0
C. edentata	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
C. elegans	4	1	0	8	0	0	59	26	40	45	21	15	13	0	0
C. haddoni	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0
C. lophura	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
C. loricata	0	0	0	0	0	0	0	1	12	0	1	2	0	0	0
C. mamillata	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
C. nasotuberculata	1	0	2	0	0	0	9	3	28	1	7	22	0	0	0
C. obtusata	0	0	0	1	1	4	1	0	1	4	1	0	1	0	1
C. procera	0	0	0	0	0	1	1	3	1	0	0	4	0	0	0
C. skogesbergi	0	0	0	0	0	1	0	0	1	1	0	1	0	0	0
C. spinifera	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
C. subarcuata	0	1	2	2	2	21	0	1	31	0	0	6	0	0	0
C. symmetrica	0	0	0	0	0	2	2	0	8	1	0	9	2	0	5
C. teretivalvata	2	0	2	26	19	9	2	0	2	19	5	4	0	0	0
Unidentified	0	0	3	0	0	48	0	0	90	0	0	123	0	0	20

Station WS 977. Date 6/7. iii. 50. Position 22° 39′ S., 12° 16′ E. Time 21 12–00 19 hr. Sounding 1970 m. nearby later.

	50–0 m.			100–50 m.			250–100 m.			500–250 m.			750–500 m.			1000–0 m.		
	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.
C. alata	0	0	1	0	0	0	0	0	4	6	2	36	5	5	0	8	6	72
C. curta	2	0	2	0	0	4	0	0	1	0	0	0	0	0	0	0	2	4
C. echinata	0	0	0	1	0	0	0	0	0	2	1	1	1	0	0	2	2	4
C. elegans	50	33	46	7	7	6	7	8	24	37	27	55	15	1	1	120	104	258
C. loricata	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	0	1
C. nasotuberculata	1	0	0	0	3	0	8	9	3	8	14	54	3	1	8	23	19	156
C. obtusata	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
C. procera	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
C. skogsbergi	0	0	0	0	0	0	0	0	0	4	3	2	0	0	0	3	2	2
C. subarcuata	0	0	0	0	1	0	1	0	8	0	2	3	0	0	0	1	1	10
C. symmetrica	0	0	0	0	0	0	0	0	0	1	0	1	0	0	9	2	2	10
C. teretivalvata	4	1	4	0	0	0	11	5	5	1	1	1	0	0	0	5	10	21
Unidentified	0	0	11	0	0	0	0	0	0	0	0	137	0	0	22	0	0	295

Station 978. Date 7. iii. 50. Position 22° 28′ S., 14° 42′ E. Time 1010–1228 hr. Sounding 932 m.

	50–0 m.			250–100 m.			500–250 m.			500–350 m.			750–500 m.		
	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.
C. alata	0	0	0	1	1	0	7	2	29	4	4	17	8	0	0
C. curta	0	0	0	0	1	3	0	0	7	0	0	0	0	0	0
C. echinata	0	0	0	0	0	0	1	0	1	1	0	1	0	0	0
C. elegans	0	1	0	4	2	1	52	19	62	16	8	6	0	0	1
C. loricata	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
C. nasotuberculata	0	0	0	1	2	3	20	13	49	10	13	64	0	0	0
C. skogsbergi	0	0	0	0	0	0	3	2	1	4	0	2	0	0	0
C. subarcuata	0	0	0	1	0	1	0	2	3	0	0	0	0	0	1
C. symmetrica	0	0	0	0	0	1	0	0	0	0	0	3	0	0	0
C. teretivalvata	0	0	0	5	2	4	2	0	2	0	0	0	0	0	0
Cypridina sp.	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Unidentified	0	0	0	0	0	18	0	0	191	0	0	118	0	0	11

No Ostracods were found in the 100–50 m. sample.

Station 979. Date 7. iii. 50. Position 22° 47′ S., 13° 35′ E. Time 2225–2255 hr. Sounding 139 m. Samples taken at 50–0 and 100 to 50 m. contained no Ostracods.

Station 980. Date 8. iii. 50. Position 22° 44′ S., 14° 08′ E. Time 0255–0325 hr. Sounding 106 m. Sample taken 50–0 m. contained no Ostracods; the 100–50 m. sample contained a single female *C. teretivalvata*.

Station WS 981. Date 8. iii. 50. Position 22° 44′ S., 14° 20′ E. Time 0635–0701 hr. Sounding 64 m. A sample taken 50–0 m. contained no Ostracods.

Station WS 986. Date 10. iii. 50. Position 25° 15′ S., 13° 06′ E. Time 0825–1118 hr. Sounding >1000 m.

	100–50 m.			250–100 m.			500–250 m.			750–500 m.			1000–750 m.		
	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.
C. alata	0	0	0	0	1	9	1	0	68	1	0	0	1	0	0
C. bispinosa	0	0	0	2	0	0	0	0	1	0	0	0	0	0	0
C. curta	0	0	2	4	4	21	0	0	0	2	0	1	0	0	2
C. daphnoides	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
C. echinata	0	0	0	0	0	0	1	1	5	0	0	0	0	0	0
C. elegans	0	0	0	3	2	23	65	38	174	6	1	0	3	0	0
C. hirsuta	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
C. lophura	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0
C. loricata	0	0	0	0	0	0	1	0	0	1	1	0	0	0	3
C. macromma	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
C. nasotuberculata	0	0	0	6	1	3	15	17	51	0	0	0	0	0	0
C. skogsbergi	0	0	0	0	0	0	3	1	2	0	0	0	3	0	0
C. subarcuata	1	1	0	0	0	3	0	0	2	0	0	0	0	0	0
C. symmetrica	0	0	0	0	0	0	0	0	3	0	0	4	1	1	7
C. teretivalvata	0	0	0	5	1	10	1	0	2	0	0	0	0	0	0
Unidentified	0	0	0	0	0	5	0	0	70	0	0	8	0	0	8

The 50–0 m. sample contained no Ostracods.

Station WS 987. Date 10. iii. 50. Position 25° 13′ S., 13° 43′ E. Time 1822–1955 hr. Sounding 293 m. Samples taken 50–0, 100–50 and 250–100 m. contained no Ostracods.

Station WS 988. Date 11. iii. 50. Position 25° 12′ S., 14° 22′ E. Time 0035–0115 hr. Sounding 135 m. Samples taken 50–0 and 100–50 m. contained no Ostracods.

Station WS 989. Date 11. iii. 50. Position 25° 11′ S., 14° 39′ E. Time 0303–0322 hr. Sounding 70 m. A sample taken 50–0 m. contained no Ostracods.

Station WS 996. Date 12. iii. 50. Position 28° 41′ S., 13° 25′ E. Time 1610–1858 hr. No sounding.

	50–0 m.			100–50 m.			250–100 m.			500–250 m.			750–500 m.			1000–750 m.		
	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.
C. alata	0	0	1	0	0	0	0	0	0	2	0	6	0	0	6	1	0	1
C. bispinosa	0	0	0	0	0	0	2	0	1	1	0	8	0	0	0	0	0	0
C. chuni	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
C. curta	2	1	1	1	0	0	1	2	7	8	5	8	0	0	3	0	0	0
C. daphnoides	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
C. echinata	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0
C. elegans	1	0	1	0	0	0	9	7	20	43	31	62	24	7	10	9	3	3
C. haddoni	0	0	0	0	0	0	0	0	0	4	0	1	2	1	0	1	0	0
C. lophura	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0
C. loricata	0	0	0	0	0	0	0	0	0	1	0	4	0	0	3	0	0	0
C. mollis aff.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
C. nasotuberculata	0	0	0	0	0	0	0	3	0	0	3	2	0	3	2	0	0	0
C. obtusata	0	0	0	0	0	0	3	1	0	1	0	0	0	0	0	0	0	0
C. procera	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
C. skogsbergi	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2	0	0	2
C. spinifera	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
C. subarcuata	0	0	0	0	0	0	0	0	9	0	0	3	0	0	0	0	0	0
C. symmetrica	0	0	0	0	0	1	0	0	0	0	0	13	0	0	20	1	2	1
C. teretivalvata	0	0	0	1	0	0	2	5	1	0	0	0	0	1	0	0	0	0
Unidentified	0	0	3	0	0	3	0	0	43	0	0	76	0	0	36	0	0	10

Station WS 997. Date 13. iii. 50. Position 28° 40′ S., 14° 06′ E. Time 0105–0410 hr. Sounding 1075–983 m.

	50–0 m.			100–50 m.			250–100 m.			500–250 m.			750–500 m.			1000–750 m.		
	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.	♀	♂	juv.
C. alata	0	0	0	0	0	0	0	0	0	1	0	0	1	0	2	0	0	0
C. bispinosa	1	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0
C. curta	0	2	5	3	1	29	0	3	18	3	0	9	0	1	3	0	0	2
C. daphnoides	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
C. echinata	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
C. elegans	4	0	2	1	1	26	2	1	10	1	1	16	2	0	5	1	0	3
C. haddoni	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
C. lophura	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
C. loricata	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
C. nasotuberculata	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
C. obtusata	0	0	0	0	0	0	2	1	3	4	3	6	0	0	1	0	0	0
C. skogsbergi	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
C. subarcuata	0	0	3	0	0	3	1	0	3	0	0	3	1	0	1	1	0	0
C. symmetrica	0	0	0	0	0	0	0	0	0	1	0	2	1	0	2	2	1	2
C. teretivalvata	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Halocypris globosa	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Unidentified	0	0	0	0	0	3	0	0	4	0	0	29	0	0	42	0	0	7

Station WS 998. Date 13. iii. 50. Position 28° 40′ S., 14° 43′ E. Time 0810–0850 hr. Sounding 198 m. In the 50–0 m. sample there were no Ostracods. The 100–50 m. sample contained one juvenile not yet identified and the 175–100 m. sample contained one female *C. elegans*, one female and one juvenile *C. obtusata* and one male *C. teretivalvata*.

Station WS 999. Date 13. iii. 50. Position 28° 38′ S., 14° 49′ E. Time 1125–1200 hr. Sounding 171 m. Samples taken 50–0, 100–50 and 175–100 m. contained no Ostracods.

Station WS 1000. Date 13. iii. 50. Position 28° 40′ S., 15° 29′ E. Time 1940–2030 hr. Sounding 188 m. Samples taken 50–0, 100–50 and 150–100 m. contained no Ostracods.

Station WS 1001. Date 14. iii. 50. Position 28° 40′ S., 15° 56′ E. Time 0005–0140 hr. Sounding 121 m. A sample taken 50–0 m. contained no Ostracods. A 100–50 m. sample contained a single juvenile of *C. curta*.

Station WS 1002. Date 14. iii. 50. Position 28° 40′ S., 16° 14′ E. Time 0302–0330 hr. Sounding 69 m. Sample taken 50–0 m. contained no Ostracods.

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